ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXXXVIII. No. 3556. JANUARY 18, 1946 9d. WEEKLY

Co-ordinated Installation

Functions of the Architect and Engineer.

IT is an old cause for complaint that lack of appreciation of the potentialities of electrical services and of the problems involved in installing them in new buildings often adds to their cost and prevents their being used to the greatest advantage. The position becomes worse with increasing mechanisation, implying greater electrification, of the processes carried on in the buildings, as this tends to make their contents more important in comparison with their shell.

By tradition and in view of his initial part in the design of a building, the architect has usually been regarded as the most suitable person to supervise and co-ordinate the work entailed in its equipment, but the views on this point expressed by Mr. W. A. Watson last week, at the Institution of Electrical Engineers, and generally supported in the discussion of his paper, indicate the serious defects of this practice. Electrical services tend to suffer most from any shortcomings in present methods, possibly because the idea persists that lighting is still considered to be its main function and (always incorrect) that it is a simple matter to run a few lengths of conduit to fit in with what has been arranged earlier for the other services.

Discussions at the Beginning

Yet for any failure to meet impracticable demands that lead to delays in completion of a contract it is the electrical engineer who is often held to blame. It is not always realised that to meet modern requirements in the way of electrical equipment calls for long runs of heavy cables properly segregated and preparatory investigations into many other aspects that may require many months of hard work. Hence the need for those responsible for the electrical installation to be brought into discussions right at the very outset and at every stage throughout the progress of the work.

Dovetailing of Contracts

As an illustration of the kind of dovetailing of contracts that is required, the procedure adopted in the construction of electric power stations can be taken. The strictly electrical part of the work does not provide a major proportion of the total—possibly not more than is to be found in many industrial processes. Yet there is no question of its being regarded of less importance than the building or than the civil and mechanical engineering sections. It is recognised from the beginning as forming an integral part of the scheme as a whole and its progress is controlled stage by stage by engineers exercising overall responsibility who are experienced in this class of work and who themselves retain specialists to advise them on matters outside their own sphere. On that account power stations can be built and set to work with a minimum of delay due to " unforeseen causes."

There is an important addendum to this point. Engineers will be in sympathy with the operating man's point of view and will realise in his constructional work that the plant in the building will have to be run and maintained with the fewest obstacles to achieving the highest efficiency.

In the light of all the considerations involved, Mr. Watson's submission that in order to obtain the best results engineers should be retained, who will see to it in the interests of their clients that the electrical aspects receive full attention from the origin of a scheme, seems only common sense.

Steel Towers

A FEATURE of the discussion of Mr. P. J. Ryle's I.E.E. Transmission Section paper on steel tower economics—a discussion in which civil and structural engineers played a helpful part—was the absence of reference to electrical values in a subject of such first-class importance in electrical development. It thus provides a classic illustration of how wide is the technical range to be covered by the term "electrical engineering." The empirical formulæ devised by the author will, we believe, save designers many hours of hard mental work in co-ordinating almost infinitely variable data.

Austerity Transmission

NEED for continued economy in the use of materials is reflected in the Electricity Commissioners' intention to consider modifications to their Overhead Line Regulations. Their purport will be to make of general application to rural areas the lighter constructions permitted for high-voltage lines in specific instances for meeting temporary war demands as set out in the Commissioners' circular of September 16th, 1942. Experience has shown that with the lighter supports employed, a 14-ft. ground clearance is a more practicable minimum than the 15 ft. allowed under the Electricity Supply Regulations. No. 10 (b) has been amended accordingly, and after the date of the order, January 10th, Table 5 of the B.S. of 1938 replaces Table 4 of the 1934 edition.

Earth Connections

ALTHOUGH the inclusion of a switch or link for opening an AC earth connection temporarily for testing or fault location was permissible under No. 4 (4) of the Electricity Supply Regulations, the practice was subject to the provision that every AC system above 125 V should be connected with earth in such a way as to ensure at all times an immediate and safe discharge of energy. There is, however, a risk that this provision may not be appreciated, leading to the assumption that the connections with earth of the neutral point could be broken while the circuit was alive. This, the I.E.E. Committee on Multiple Earthing has pointed out, might result in dangerous voltages on consumers' premises. The Commissioners have therefore deleted Regulation 4 (4). Leakage tests on live circuits can always be made by means of clip-on ammeters.

Electrical Employment

THERE is still a two or three months' time lag in the publication of employment figures in the *Ministry of Labour Gazette*. The latest figures to appear relate to October last and they actually show a fall in the total number of persons employed as compared with September. This decline was contributed to by electrical engineering for which a total of 158,700 is shown, against 163,000 in September, mainly due to a decrease in the number of women employed. In the electrical apparatus, cable and lamp group, too, there was a fall—from 261,900 to 249,700. In this case there was a decline from 151,400 to 140,100 in the number of women. On the other hand, there was greater employment in the electrical contracting industry (rather curiously classified under "Metal Goods Industries"), the total rising from 38,500 to 39,300, in spite of a slight decline in the number of women employed—from 5,300 to 5,200.

Hire or Hire-Purchase

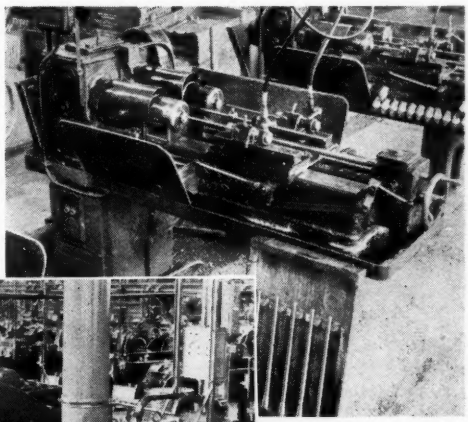
As things are at the moment the question whether domestic appliances should be supplied on hire or hire-purchase would seem to be a somewhat academic one. But these appliances will gradually be available in greater quantities and electricity supply authorities have to decide upon policy now. The matter was debated at Brighouse recently, when hire-purchase was settled on. The principal argument in favour of this appeared to be that consumers who were buying their appliances naturally tended to look after them better than if they were merely hirers. This is a sad truth which sometimes makes simple hire a troublesome business. At the same time, as we have said before, if the gas undertakings resume hiring generally electricity supply authorities may be forced to do the same.

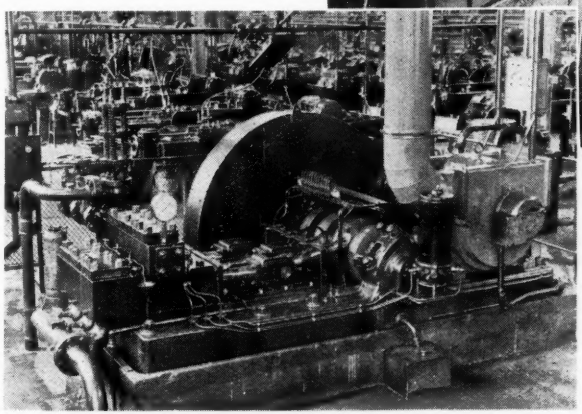
Rifle Manufacture

Electrical Applications to a Mass-Production Scheme

BY the courtesy of the Ministry of Supply we have recently visited a Royal Ordnance Factory (Fazakerley) which was built during the war for producing small arms in great quantities at a time when they were urgently needed, and in which the majority of the labour employed consists of women who have been specially trained in the jobs they are doing. Rifles and Sten guns are the products of the factory, and in their manufacture the most up-to-date machines are used, all self-contained with individual drives and controls, and all directly or indirectly electrically operated.

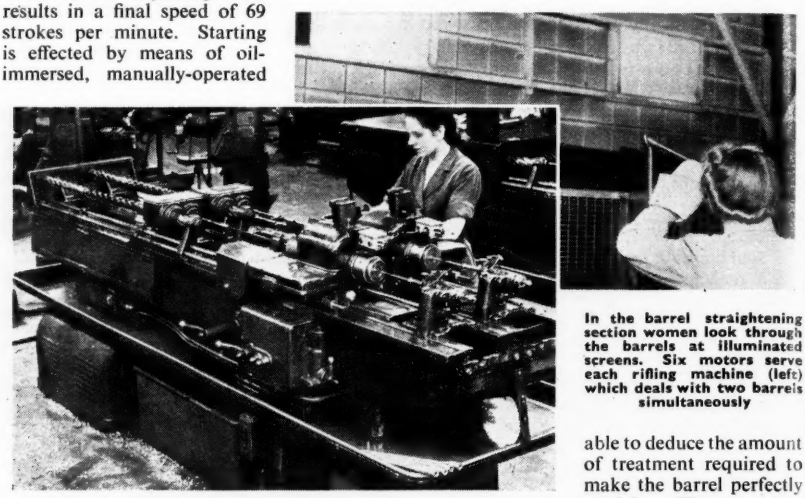
The rifle is made up of many components; it is proposed to describe briefly the electrical applications to the methods of manufacture of the major components, *i.e.*, the barrel, body or breech mechanism, the bolt and the woodwork. Raw forgings are delivered to the factory for the barrel, and after initial inspection they are passed on to the milling machines on which they are subjected to the first operations of end milling and coning. They are next dealt with by cam-operated lathes which give them their external shapes and dimensions. The next operation of boring is one of special interest, and is effected on horizontal machines, each of which deals with two barrels at a time. The driving motor, which is situated in the base of the machine, is rated at 2 HP, 1,420 RPM, 400 V, and is controlled by a Crabtree direct-on contactor-type starter, with the start and stop buttons conveniently placed on the machine for the operator. The actual boring tool is a "D" shaped bit, and during the operation oil at 1,000 lb. sq. in. is forced up the centre of the bit to assist in the drilling and to clear the swarf back from the cutting edge along the flat of the tool. Two horizontal three-throw ram pumps supply and maintain the pressure of this oil. Each set of pumps is driven by a 56-HP slip-ring motor, with pipe ventilation so connected as to take air from the outside atmosphere to prevent oil vapour from being drawn into the motor with consequent risk of damaging the winding insulation.



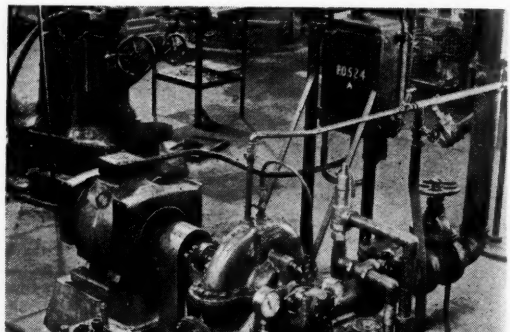


Each of the boring machines deals with two barrels at a time. Horizontal three-throw ram pumps (left) supply and maintain the oil pressure for the barrel boring operations

The motor speed is 720 RPM, and transmission to the pump rams is *via* a double helical reduction gearing which results in a final speed of 69 strokes per minute. Starting is effected by means of oil-immersed, manually-operated resistance steps, and the motor is not provided with short-circuiting gear for the rotor. The oil is pumped through overhead pipes to the various boring machines and is returned to a central sump for sieving. It is then allowed to flow over magnetic separators which remove all the fine metallic dust received by the oil during the operations. The separators are energised at 200 V DC which is supplied by a local 1·5-kW metal rectifier. The oil is then ready for recirculation.



In the barrel straightening section women look through the barrels at illuminated screens. Six motors serve each rifling machine (left) which deals with two barrels simultaneously

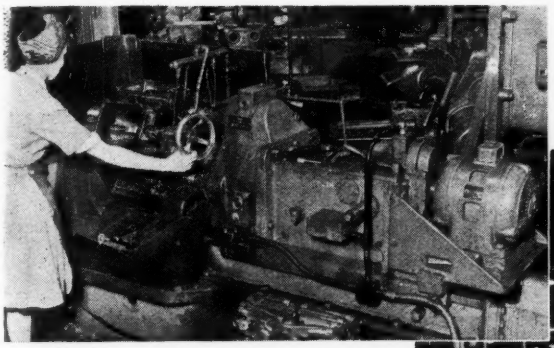


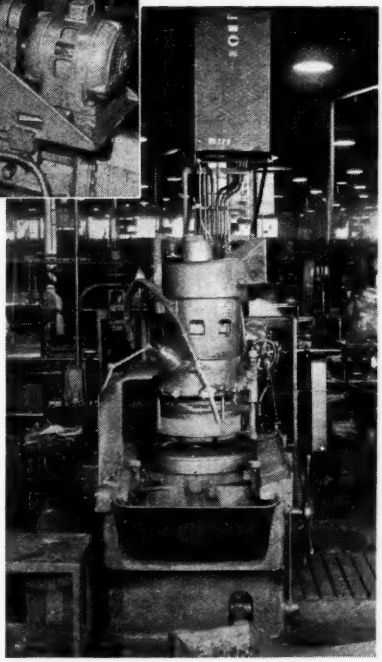
The many milling operations require a copious amount of coolant which is supplied by 16·5 HP motor-driven pumps

After boring, the barrels are passed on to the barrel straightening section where women look through the barrels at screens, each measuring about 4 ft. 6 in. long and 2 ft. deep. Each screen is illuminated by a fluorescent tube mounted horizontally at the top of the screen, so as to direct its light on to the screen. From the various shadows cast in the bore of the barrel the operator is able to deduce the amount of treatment required to make the barrel perfectly straight. The treatment consists of light blows with a brass-headed hammer on the exterior of the barrel. It has been found after many experiments that fluorescent lighting is the most suitable

illumination for this class of work, and it is used throughout the factory wherever it is necessary to examine the bores of barrels.

After the straightening process the barrels are ready for rifling which is effected on Pratt & Whitney riflers, two barrels at a time being dealt with by each machine. Six motors serve each rifler. Two 2-HP, 950-RPM motors transmit to the moving parts of the machine, two ¼-HP, 1,425-RPM motors drive the coolant pumps, and two ⅓-HP, 1,425-RPM motors operate the small





A machine of special interest engaged in the machining of the body is a five-spindle automatic lathe (above)
Many smaller components receive grinding operations on rotary table grinders (right) with electromagnetic chucks supplied from rectifier on stanchion

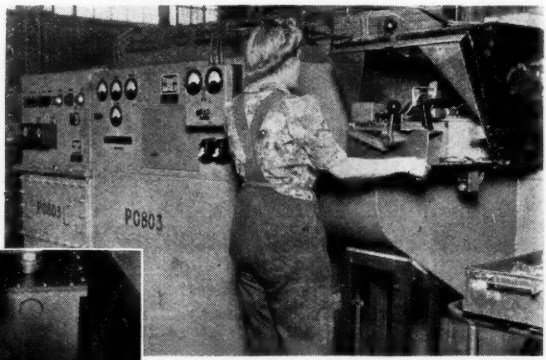
revolving brushes which clean and lubricate the rifling tool at every stroke. The main and coolant motors are situated in the base of the machine, and the brush motors and the contactor-type controls are mounted on one panel located at the end of the machine. The indexing gear (nearest the camera) is normally shrouded, and the shrouds are electrically interlocked, so that in the event of the operator attempting to open them whilst the machine is running, the supply to the motors is cut off. After rifling, the barrels are passed on to other machines for a variety of operations such as grinding, thread milling and drilling.

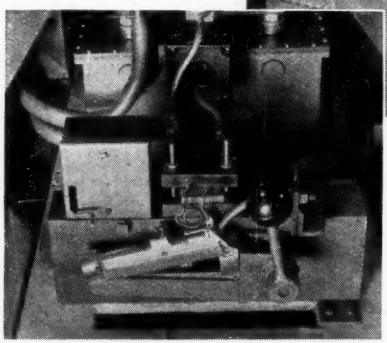
The body and the bolt receive much the same treatment as the barrel, in that they are received at the factory as forgings which are first milled before they are passed on to the boring machines. After boring, both components undergo many milling operations for which a copious supply of coolant is required. This is provided to the machines through overhead pipework from Mather & Platt "Medivane" pumps, each of which is driven by a 16·5-HP, 1,435-RPM motor directly coupled to the pump shaft. The motors are controlled by Allen West contactor-type starters equipped with no-volt and over-current protective devices.

One machine of special interest engaged in the machining of the body is a Pollard five-spindle automatic lathe. A rotating work head carries five components, and the main tool slide carries five sets of tools, each being situated in line with the corresponding component. The slide comes forward and performs an operation on each of the components and is then withdrawn. The operator takes out the component which has had five operations and then inserts another one. After inserting the new component the operator manually turns the work head through one station, and the procedure is repeated until after five movements the first

component comes round to the starting point and it is taken out. The work head is electrically interlocked with the starting gear, so that unless it is correctly indexed with relation to the tools the machine will not start. The machine is driven by a 7·5-HP, 1,450-RPM squirrel-cage motor, and a special reverse plugging switch is employed to bring the moving parts to rest quickly at the end of each operation. All the motions of the machine are automatically controlled once the operator has pressed the " start " button.

There are very many other smaller components of the rifle, and these are processed on a variety of milling and drilling machines, with further operations of grinding which are carried out on a battery of Blanchard rotary table grinders. In the tables of these machines are incorporated electro-magnetic chucks which hold the work during operations. The chucks are supplied with DC at 200 V by a 5-kW, mercury-vapour valve-type rectifier which is mounted near the machines.





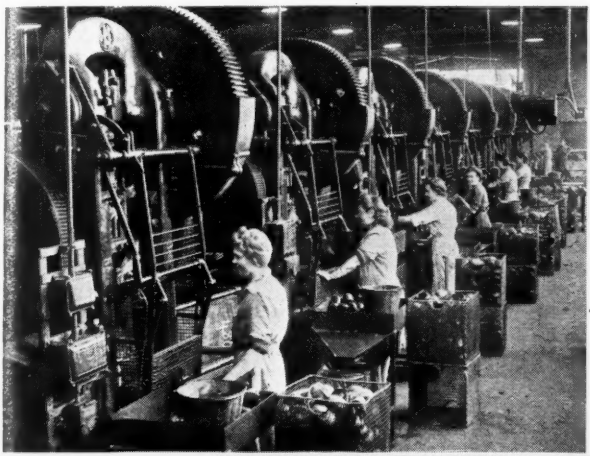
A special high-frequency equipment is used for spot-hardening on the rifle body; The inductor coil (inset) carries 350 A at 400 kilocycles

Most of the components require some form of heat treatment, and many types of electric furnaces, *e.g.*, salt-bath, open-hearth and bright-annealing equipments, are used extensively for this purpose. The majority of furnaces are automatically controlled for temperature by Foster pyrometer panels. One special installation is a Wild-Barfield-Ferranti high-frequency equipment used for spot-hardening on the rifle body. This equipment is fed from the 400-V mains and comprises a transformer and rectifier unit, an oscillator unit and a work-table fitted with a tank. The water-cooled inductor coil is of special design and carries a load of 350 A at about 400 kilocycles. The coil fits inside the body and heats up three cam faces simultaneously for a predetermined period which is governed by a time switch calibrated in seconds, and then the jig which carries the body is tripped and the component falls down into the quench tank. The whole operation is completely automatic, the operator merely having to put the component on the jig, draw down the protective hood, which operation switches the set on, and wait until the component falls. The set is then ready to take another component.

A line of presses is installed for the production of rifle magazines. Blanks are first stamped out from flat sheet steel, and each is then subjected to a series of drawing operations until the final shape is achieved. Each press is powered by a 7·5-HP, 705-RPM squirrel-cage motor, and transmission is by V-belt and gearing to heavy flywheel racks. Starting is by star-delta equipments. After each pressing operation the component has to be annealed, and this is effected in a bright-annealing travelling-type furnace which has preheating and cooling " tubes " leading to and from either end of the heating chamber.

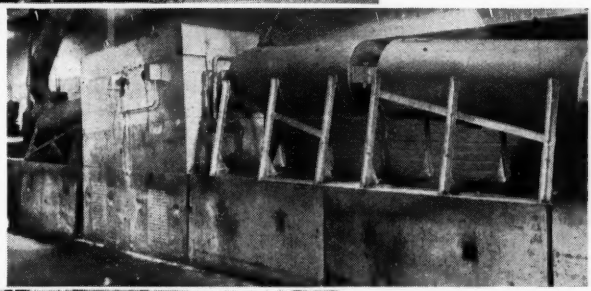
On completion of all the heat-treatment and machining, the components are passed on to the Parkerising section where they are treated in special baths with a solution which renders them rustproof. They are then

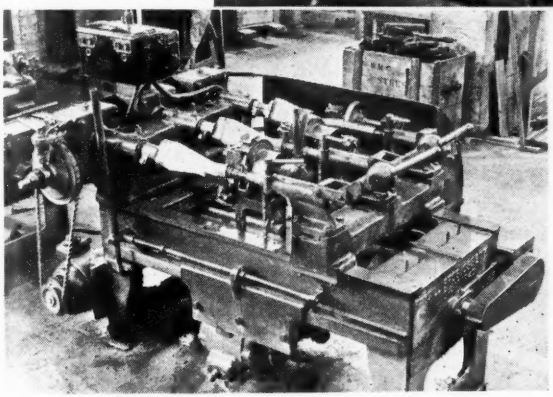
ready for spray painting or staining. The spray booths are illuminated by fluorescent lighting equipment which affords a high degree of illumination without glare on the tube type. The tubes are connected in such a manner that most of the stroboscopic effect is eliminated. Glass fronts are fitted to the reflectors to prevent paint being sprayed on to the tubes, and the whole unit gives a very even lighting intensity of approximately 36 ft.-candles at the point of spraying.



A line of presses is installed for the production of rifle magazines from flat sheet steel in a series of drawing operations

The woodwork of the rifle is received at the factory in the form of rough blocks in a green state. These are passed through a kilning process, equivalent to weathering, which renders them fit to be worked upon. After inspection for splitting or other defects, they pass into the woodworking shop where they are sawn, planed, and shaped by a variety of machines of which some have special features. The butt is brought roughly to shape and is then passed on to a copy-turner in which a cutter spindle, governed by a master cam, cuts the wood to a shape which could not be produced in a components, and enables the operator to see that every part is properly sprayed. The fittings are mounted horizontally across the top front of each booth and are of the twin-





Above: Heat treatment of the magazines is effected in a bright-annealing travelling-type furnace

Left: The rifle butt is given final shape in a copy turner

normal lathe. A 2-HP, 1,442-RPM motor, situated to the left of the machine as seen in the illustration, drives the work-heads and the traversing carriage *via* V-belts, and two 3-HP, 2,910-RPM motors mounted on the traversing carriage drive the cutter spindles, again by V-belts. The fore-end (that part of the woodwork in which the body and barrel are encased) is also subjected to several profiling operations on a Wadkin 5-spindle profiler. Five sets of cutters are mounted on a revolving cage and each cutter does its respective job and is then moved round to bring another tool on to the component. The drive in this case is a 2-HP, 1,440-RPM squirrel-cage motor mounted at the rear of the machine, with leather-belt transmission so arranged that at the end of each operation the belt can be moved upwards off the pulley of the outgoing spindle and then moved downwards on to the incoming spindle, the component remaining stationary during the five operations.

Municipal Reports

Edinburgh

DURING last winter it was necessary to switch out certain sections of the Edinburgh system at times of overloading. To ameliorate this condition an expenditure of £350,000 on a 33,000-V distribution scheme with nine sub-stations has been sanctioned and a second part of the scheme, a new switch house at Portobello, estimated to cost some £250,000, is under consideration.

Total sales within the Edinburgh system during the year ended May 28th last amounted to 259·1 million kWh, compared with 239·2 million kWh in the previous year, an increase of 8·3 per cent. In addition 59·9 (45·8) million kWh was supplied in bulk.

Income on revenue account aggregated £1,392,877 and working expenditure £1,099,945, leaving a gross surplus of £292,932, and after meeting various charges (including £5,454 contribution to capital expenditure) there was a net surplus of £35,561). The engineer and manager (Mr. J. F. Field) states that some increase in prices all round to cope with the further rise in the price of coal is inevitable, but his first endeavour has been to simplify the whole tariff structure, and the number of alternative tariffs has already been substantially reduced.

Stockton-on-Tees

Total sales of the Stockton-on-Tees undertaking in 1944-45, at 26·2 million kWh, were slightly less than in the previous year, which is attributed to meter readings being behindhand. In the accounts, comparison is upset by the inclusion in the 1943-44 figures of a bulk supply rebate of £34,166 in respect of the years 1938-43 and the charging of £15,800 income tax on this in the 1944-45 expenditure. Income was thus £145,293 (against £179,637) and expenditure £160,483 (£133,944). In his report Mr. N. Hunter, who was appointed general manager and engineer last February on the retirement of Mr. S. G. Marston, gives details of schemes for extending and reinforcing the network, including a new ring main.

Frequency Standards

Development and Use by the Post Office Engineering Department

WHAT frequency standardisation means to the telecommunications engineer and the work done by the Post Office in this connection are described in a paper prepared by Messrs. C. F. BOOTH and F. J. M. LAVER (P.O. Engineering Department, Radio Section) for the Radio Section of the Institution of Electrical Engineers.

Published information on the subject is scanty, so the authors commence with a historical review and end with a bibliography of 38 references. They then briefly analyse factors which affect the design of a standard and proceed to the consideration of performance and applications in some detail. In particular the absolute calibration of the group of crystal-controlled oscillators comprising a standard is discussed and details are given of equipment designed for the precise inter-comparison of the several frequencies of the individual oscillators.

The quartz-controlled oscillator is at present the best means of attaining to the greatest constancy of frequency and the authors believe that future development will be directed towards the achievement of the long periods of continuous service which are necessary for accurate calibration.

Available methods of comparing frequency standards are analysed, revealing advances made in the last twenty years; it is considered that the absolute value of the P.O. standard is at present known to $\pm 1 \times 10^{-8}$. Means of improving its stability and reliability are outlined.

E.P.E.A. Northern Area Dinner

MR. H. HORTON, secretary of the Northern Area of the Electrical Power Engineers' Association, speaking to the Aberdeen section at its semi-jubilee dinner on Friday, said that the electricity supply industry had nothing to fear from the discovery of atomic power. It would simply be a substitute fuel. The need for generation and distribution would still be there. With regard to nationalisation proposals, he said there could be nothing more dreadful than "long distance" control of the industry. They should use all their influence to ensure that control was left in the hands of those who were best fitted for it. Stressing the importance of the industry by saying that the capital involved was £700,000,000, Mr. A. Gardner, Corporation electrical engineer, Aberdeen, said it was an efficient industry, a truth which applied to small as well as large undertakings.

Steel Tower Economics

Views of Structural Engineers

MEMBERS of the Structural Building Engineering Division of the Institution of Civil Engineers and of the Institution of Structural Engineers attended as guests last week's meeting of the Transmission Section of the Institution of Electrical Engineers at which Mr. P. J. Ryle's paper on steel towers for overhead lines (*Electrical Review*, January 11th, p. 62) was presented.

In opening the discussion MR. C. O. BOYCE (British Insulated Callender's) said the presence of constructional engineers offered a timely opportunity to exchange views, for many aspects of tower design were determined by erection considerations. Galvanising was the ideal solution of the maintenance problem, so far as present knowledge went. He criticised the author's formulæ for the weight of towers and suggested that the base dimensions were of greater importance than was indicated by the paper, because some of the costs in this respect were unpredictable and, furthermore, they depended on skilled labour which was getting less efficient. The record of steel towers in this country was better than in any other country in the world subject to similar weather conditions.

MR. G. WILSON (Soil Mechanics, Ltd.) discussed the analogy between tower construction and bridge building and pointed out what he thought were certain advantages in the formulae used by bridge engineers.

Importance of Base Dimensions

MR. H. W. GRIMMITT (Electricity Commission) said that on the dimensions of the base of the tower depended very largely the whole economy of the overhead line. There was a most economic spread at the base which nearly always made the best foundation and, a tower with the best appearance.

MR. D. J. DAVIES (British Steelwork Association) referred to the smaller loadings and factors of safety adopted in American tower designs and suggested that they might prejudice this country in competing for foreign contracts.

MR. E. S. BROADHEAD (J. L. Eve Construction Co.) said he had tried to reduce costs by simplification of details, but the cost per ton always seemed to be about the same. Erection costs could be kept low if designers did not try, for instance, to bolt through six different members before any of them was secure.

MR. J. MCHARDY YOUNG (Southern Railway) regretted that the author had not gone into the broken conductor conditions very fully. He thought research was necessary in that respect.

MR. A. C. FIELDING (Kennedy & Donkin) thought the paper useful in that it enabled the cost of a tower to be arrived at quickly. It might be worth while considering whether the broken conductor loadings adopted were essential, particularly at 132 kV and more. The suspension spring would reduce the broken conductor loading a great deal and that might account for so few tower failures.

Saving Steel

MR. A. E. PERCIVALL (Blaw, Knox, Ltd.) pointed to the possibility of reducing weight by narrowing the base, which tended to increase foundation costs, but the savings in steel at present prices counterbalanced that. He thought the author's formulæ would save the designer much time and labour.

MR. R. A. PAINTER (Painter Bros., Ltd.) stressed the very great need for ensuring that draughtsmen acquired adequate knowledge of the practical side of tower calculations.

MR. J. R. HARDING (Pirelli-General) commented on the great use made of narrow base towers on the Continent. He could only assume it was due to the fact that the extra man-hours involved in construction did not have the same extra cost in money, the foundation work being sub-contracted.

The Author agreed that maintenance considerations were very important. The loadings and factors of safety adopted in America should not prejudice our ability to compete for foreign contracts for presumably the conditions would be specified. For very tall towers there was much to be said for making the base narrow and using the " huskiest " of members, but he was not sure he agreed with that view when using built-up members. It was very difficult to state whether the allowance made in this country for broken conductor conditions was justifiable. He believed the Continental narrow base towers were due to the wayleaves system.

Views on the News

Reflections on Current Topics

ELECTRICITY " on tap " is not a new idea. The time is coming when the importance of electricity will be second only to that of water in the home. Practically everywhere in this country water is available *ad libitum* upon the payment of a periodic rate and eventually when everybody uses electricity for all domestic services the same method should be feasible. The matter was broached recently at Scunthorpe, when a councillor suggested that both gas and electricity should be supplied freely, a rate being levied to cover the cost. This proposal was not favourably received, one reason being that one of the Council's undertakings (whether gas or electricity was not stated—but I can guess) had already been a charge on the rates long enough.

* * *

As a sidelight on the paucity of technical books dealing with the more practical aspects of electricity, I was recently asked to recommend " really good modern " books on electric lifts, cranes and excavating machinery. Those in my own library that cover these subjects bear dates between 1921 and 1930. Even if these could be described as modern, they are now unobtainable, as inquiry of their various publishers reveals that they are all out of print. If readers know of any books that meet the requirements stated I should be very pleased to hear from them.

* * *

I am not surprised to hear that the Electrical Contractors' Association has protested to the Government in the matter of the uncontrolled disposal of aircraft wiring cable. The Electricity Commissioners found it necessary to issue a general warning after they had been notified of instances in which this wire had been used for 200/250-V installations. The cores are ·029-in. single wire with a very light rubber insulation. The E.C.A. says that it persistently warned the Ministry of Supply that all sorts of unqualified people would purchase the wire and use it in a dangerous fashion, but the warnings were disregarded.

* * *

Dover Corporation, which hitherto has not sold appliances at its showrooms, has been urged by its Electricity Committee to exercise its full powers under the Electricity (Supply) Acts with regard to the sale of equipment. The Committee reported that it considered that no good purpose would be served by receiving a proposed deputation on the subject from the local branch of the E.C.A. These are the main facts, but I read that an alderman said that Dover people had gone to another town where they *could* buy appliances, by implication at the municipal showrooms. This, if a fact, raises a pretty point: Section 48 (*b*) of the 1926 Act stipulates that " The joint electricity authority or local authority shall not sell electric fittings except (i) to a consumer or a person who intends to be a consumer of electricity supplied by them. . . ." Do showroom attendants always make sure that customers are local consumers ?

* * *

Operating on somewhat the same lines as the " electronic ratter " to which I referred recently, an electronic canteen machine for heating and serving " hot dogs," hamburgers and grilled cheese sandwiches is announced in America. The *New York Herald Tribune* says that the machine looks something like the usual soft drink or cigarette machine. A customer drops in a coin and pushes a selection button. This tips a tray and down into an electronic oscillation coil, visible to the customer, falls a wrapped sandwich or whatever other item is chosen. High-frequency waves heat the food to the proper temperature, whereupon it falls into a glass-door compartment, ready for the customer to unwrap and eat.

* * *

Another electronic device reported from America is a " smeller " capable of detecting the presence of one part of mercury vapour in 100 million parts of air. It is intended for use in areas where the fumes might be injurious to the health of workers. The " smeller " is said to operate on the principle that ultra-violet light is scattered when it passes through atmosphere containing the toxic fumes.

* * *

Among the objects of the British Interplanetary Society, Ltd., recently registered to take over an existing body of the same name, is " scientific research for establishing and maintaining communications between locations on the earth and positions not on the earth, and to construct mechanical, electrical and other devices necessary to facilitate such communications." Recollecting how often Mr. H. G. Wells has been justified as a prophet (to say nothing of Jules Verne), I hesitate to wax facetious upon the prospects thus unfolded; I shall only say that I await with interest details of any " mechanical, electrical and other devices " which may be developed by the Society.—

REFLECTOR.

Reciprocating Machine Tools

Simplification of Electrical Arrangements

By J. Lewis, A.M.I.E.E.

THE exacting demands imposed on machine-tool manufacturers to meet specified operating refinements have resulted in elaborate electrical arrangements. A modern reciprocating machine tool, say a large slotting machine, may have, in addition to the main reversing motor and the motor-generator associated with it, the following additional motors:—Tool-feed mechanism; revolving - table; sliding - table; oil - lubricating-system; blower to reduce temperature rise on main reversing motor at low speeds.

As the foregoing equipment will be electrically interconnected, largely automatic in action and to some extent fool-proof, the control panel or cabinet is so complicated that its maintenance may well be beyond the capacity of the average works electrician. Is it reasonable to expect less than a specialised technician to service it adequately? Cannot electrical arrangements be simplified without too great a sacrifice?

Consider the development of the planing machine. When the single-motor drive was discarded, a "Ward-Leonard" arrangement was introduced in which a motor-generator was interposed between the main reversing motor and the source of supply. When the supply is DC, the generator of the set provides power to the planer-driving motor. The generator and planer motor are separately excited, and each field winding is provided with a hand-operated regulator. Within the capacity of the machine, the speed of the planer motor may be regulated by varying the voltage across the generator armature by means of its field regulator, whilst holding the field current of the planer motor constant, or by holding the voltage across the generator armature constant and adjusting the field current of the planer motor or by a combination of the two. A two-pole throw-over switch, actuated by the movement of the planer table, reverses the field current of the generator, which in turn reverses the polarity of the current and so changes the direction of rotation of the planer motor.

The arrangement described provides for the running of the planer motor at the same speed in both directions and is therefore applicable only when the machine is doing useful work both ways. Normally, however, a planing machine does useful work in one direction only and on the return stroke runs very much faster. Provision can

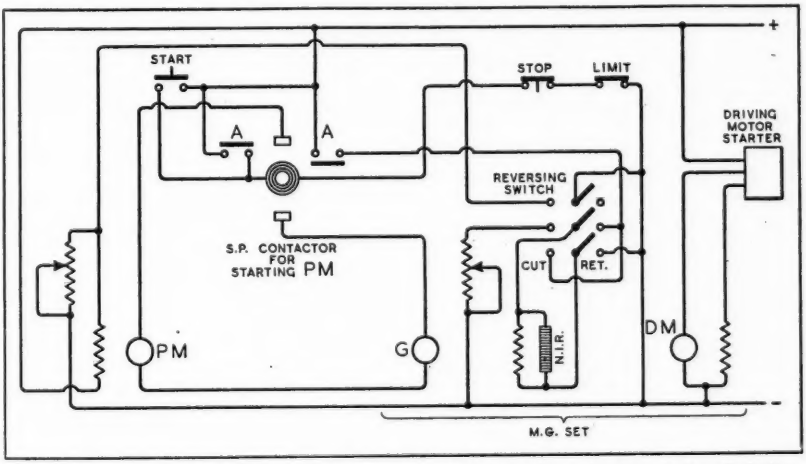


Fig. 1.—Connections of Ward-Leonard set for varying speeds on cutting and return strokes of planing machine ("A" is open when contactor opens and is closed when contactor closes)

be made for controlling the motor speed independently on the cutting and return strokes (Fig. 1). The only alteration needed is the substitution of a triple-pole for a two-pole reversing switch and the changing of a few connections. When the main supply is AC, a small DC exciter is required to provide field current for the DC generator and the planer motor.

The foregoing represents the first stage in development from the single-motor drive. It was deservedly popular, most efficient and very free from trouble. There are only a few yards of interconnecting cable and the amount of switchgear is relatively small; also the table speed can be independently controlled within very fine limits for the cut and return strokes.

There is one point here that might with advantage be cleared up for the benefit of the machine-tool operator and the mechanical section of the maintenance department. On the cutting stroke of a planer equipment, as described, there is a relationship between the HP developed by the planer motor and the speed at which it runs; the planer-motor speed is varied by adjusting the field current of the generator, which varies the electrical energy input to the motor substantially in proportion to the speed required.

On the return stroke the position is quite different. Variation in the speed of the planer motor is now effected by adjusting the field current, not of the generator, but of the planer motor, and this does not necessarily affect the HP developed. The foregoing characteristics may be illustrated by the comparison of two equipments in Fig. 2.

In the first of these (representing generally accepted practice) the planer motor is rated at 24 HP, 275 V, 460-920 RPM and the generator at 275 V, 77 A. In equipment No. 2 the planer motor is rated at 7-35 HP, 60-200 V, 118-150 A, 94-750 RPM and the generator at 60-200 V, 30 kW. The difference between the two, shown by the graphs in Fig. 2, is due to the second design being such that on the return stroke the speed of the planer motor is stabilised at 750 RPM. This indicates the importance of a correct gear ratio between the planer motor and the table of the machine.

Reverting to control gear, by fitting an accelerating switch on the planer, a few seconds of production time may be saved on the cutting stroke in certain circumstances, and a further few seconds by introducing another device to reduce the time-lag at the moment of reversal, or a solenoid may be fitted to lift the tool clear of the job on the return stroke.

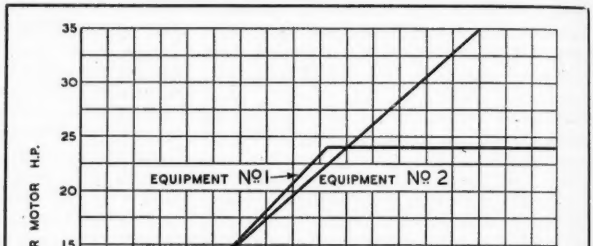


Fig. 2.—Relation between HP and speed of two designs of planer motor

All these things may be desirable, but to get them to operate automatically and precisely as required means additional contactor switches, relays, resistances, metal rectifiers, etc., until the control panel becomes a conglomeration of bits and pieces.

It takes fully two weeks for two electricians and an apprentice to wire up a modern 8-ft. planing machine with its considerable length of cabling. When the work is finished it is impracticable for anyone, expert or otherwise, to memorise more than a fraction of it.

In a few years' time, when little bits here and there begin to wear and get out of line or adjustment, it may be found, for example, that some obscure spring or other minor

item is responsible for imperfect contact between two points, the effect of which is to put the machine out of service.

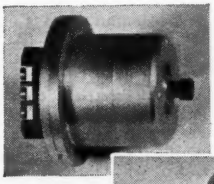
The 8-ft. planer I have in mind is provided with three wiring diagrams—a comprehensive diagram, an interconnection diagram and a schematic diagram. The total surface area of paper is 21 sq. ft., and all three drawings must be taken into account when studying the ramifications of the electrical interconnections. The average works electrician cannot be expected to master drawings like this and memorise sufficient details to materially assist him in locating a fault. All the essentials of a planer equipment to meet reasonable requirements can be put down on a sheet of paper measuring 6 by 4 in. The works electrician could carry this about in his waistcoat pocket and memorise the whole of it in a very short time.

Miniature AC Motors

Two-phase Admiralty Compass Type

SMALL two-phase induction motors have been developed at the Admiralty compass observatory (Royal Navy scientific service) for exerting the torque needed for controlling the precision of gyroscopic (Mk. II transmission type) compasses. The same machine, "tropicalised," has been adopted as the follow-up motor for (type III transmitting) magnetic compasses.

Production has begun and particulars have been released for the convenience of other Government Departments which may wish to apply these motors to other purposes.



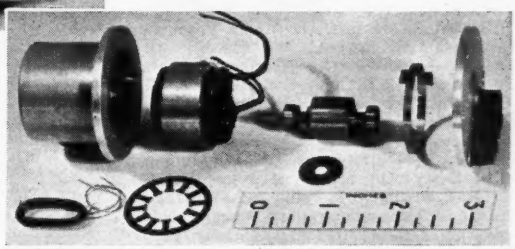
The motor is totally enclosed and flange mounted, having an aluminium alloy shell and end shield. The stator leads are connected to an external terminal block secured to the end shield. The rotor is mounted in ball bearings and the shaft extension may be arranged to project at either end. The weight of the complete motor is 5½ oz.

The stator core is built from "radiometal" laminations 0·010 inch thick secured by a brass or aluminium sleeve spun over at the ends. The assembled core is wound and impregnated and forms a readily replaceable unit which is held inside the shell by means of a flexible brass clamping ring secured by the end shield. The stator windings are of the double layer concentrated type, the individual coils being preformed and inserted in the twelve-slot core in order to form a two-phase six-pole system.

The rotor is of squirrel cage construction formed by copper strips secured in narrow slots in the laminations and soldered to copper end rings. "Radiometal" laminations and copper end-rings are clamped on to the rotor shaft by means of a nut and the 21 slots are skewed by one slot pitch to eliminate cogging. The shaft has been made of stainless steel, since (in the second application mentioned) it has to be placed fairly close to the magnetic compass, consequently ordinary steel would be unacceptable.

The deep narrow rotor bars and open-ended slots assist in providing a relatively flat speed-torque characteristic, since at high slip frequencies the current in the bars is concentrated towards the outer edge, so effectively increasing the rotor resistance at low rotor speeds.

For the first application, as a torque motor, the machine is required to operate at 333 c/s and works continuously under standstill conditions with a temperature rise at 20 V per phase of about 30 deg. C.



Two-phase high-frequency compass motor, showing rotor punchings and preformed stator coil before insertion

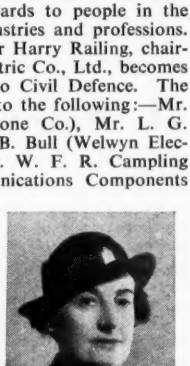
For the second application, as a follow-up motor at a frequency of 400 c/s, one phase is constantly energised, while the second phase is supplied from the output of a valve amplifier in proportion to the misalignment. Under these conditions a fixed phase voltage of 30 V gives a temperature rise of about 30 deg. C. in normal operation.

The existing stator winding is of No. 36 s.w.g. nylon-covered wire, and the use of smaller gauge wire would allow the applied voltage to be raised with proportional reduction in current requirements.

New Year Honours

Electrical Names in Second List

THE second instalment of the New Year Honours List published last week contained a number of awards to people in the electrical and allied industries and professions. Lady Railing, wife of Sir Harry Railing, chairman of the General Electric Co., Ltd., becomes an O.B.E. for services to Civil Defence. The O.B.E. is also awarded to the following:—Mr. C. S. Agate (Gramophone Co.), Mr. L. G. Allen (G.P.O.), Mr. E. B. Bull (Welwyn Electrical Laboratories), Mr. W. F. R. Campling (Directorate of Communications Components Production), Dr. R. Cockburn (Telecommunications Research Establishment, M.A.P.), Mr. T. Denness, A.M.I.E.E. (Ministry of Supply), Mr. E. H. Edwardes, A.M.I.E.E. (Lancs. United Transport & Power Co.), Mr. L. J. Edwards, M.P. (general secretary, Post Office Engineering Union), Capt. E. W. Firmin (G.P.O.), Mr. C. E. A. Griffin (S. Smith & Sons (England), Ltd.), Mr. T. Hands (B.T.H. Co.), Mr. E. Harle (Radio Production Executive), Mr. C. A. W. Harmer (Pye Radio), Mr. W. Q. Henriques (Clarke, Chapman & Co.), Capt. C. Higgins, M.I.E.E. (G.E.C.), Mr. J. L. Hilton (Hoffman Manufacturing Co.), Mr. W. G. R. Jacob (engineer-in-chief, Cable & Wireless, Ltd.), Mr. J. Macey (Admiralty), Mr. A. H. Mumford, M.I.E.E. (G.P.O.), Mr. W. H. Peters (G.E.C.), Mr. R. B. Pullin (R. B. Pullin & Co.), Mr. J. A. Ratcliffe (Telecommunications Research Establishment, M.A.P.), Mr. J. W. Ridgeway (Edison Swan Electric Co.), Mr. W. H. Smith (W. H. Smith & Co. (Electrical Engineers), Ltd.), Mr. P. A. Sporing (Telegraph Condenser Co.), Mr. W. F. Taylor (Telegraph Condenser Co.), Mr. J. C. Wade (G.E.C.), Mr. J. H. Wears (English Electric Co.), and Mr. A. Whitaker, M.I.E.E. (Nash & Thompson).



Lady Railing

The O.B.E. is also conferred on the following who have been associated with atomic bomb research:—Dr. O. R. Frisch, Mr. J. F. Jackson, Mr. C. F. Kearton, Dr. W. G. Penney and Mr. M. W. Perrin.

Among those awarded the M.B.E. are the following:—Mr. C. Andrews (W. McGeoch & Co.), Mr. H. Atkinson (English Electric Co.), Mr. C. C. E. Bellringer (Telecommunications Research Establishment, M.A.P.), Mr. G. W. Bird (Radio Production Executive), Mr. N. R. Boorman (B.T.H. Co.), Mr. J. S. Borrington (B.T.H. Co.), Mr. C. E. Bottle (B.B.C.), Mr. A. Brookes (British Industrial Plastics), Mr. B. C. Caddy (Admiralty), Mr. A. R. Chance (E. K. Cole, Ltd.), Mr. J. H. Cotton (Dubilier Condenser Co.), Mr. G. W. A. Dummer (Telecommunications Research Establishment, M.A.P.), Mr. B. J. Edwards (Pye, Ltd.), Mr. J. G. Flint (Telephone Manufacturing Co.), Mr. J. Gaunt (Joseph Lucas, Ltd.), Mr. M. R. Gavin (G.E.C.), Mr. W. H. Grinsted, M.I.E.E. (Siemens Bros. & Co.), Mr. A. J. Hall (English Electric Co.), Mr. H. L. Harding (I.R.G.P. & T. Works Co.), Mr. P. B. Healey (Telephone Manufacturing Co.), Mr. G. E. C. Hill (Metropolitan-Vickers), Mr. W. Hunt (Ferranti, Ltd.), Mr. E. R. James (International Combustion, Ltd.), Mr. T. Jolley (Admiralty), Dr. F. E. Jones (Telecommunications Research Establishment, M.A.P.), Mr. H. E. Jones (Synchronome, Ltd.), Mr. V. T. Jones (Automatic Telephone & Electric Co.), Mr. H. J. Mildren (Directorate of Communications Components Production), Mr. J. A. W. Mills (A. Reyrolle & Co.), Mr. J. M. Morris (chief electrical-mechanical engineer, Port Directorate, Basrah), Miss D. M. Noakes (Electricity Commission), Mr. J. W. H. Pengelly (I.R.G.P. & T. Works Co.), Mr. E. G. Peskett (Smith & Sons (England), Ltd.), Mr. A. Phillips (Radio Transmission Equipment, Ltd.), Mr. G. R. Polgreen, M.I.E.E. (Salford Electrical Instruments), Mr. O. S. Puckle, M.I.E.E. (A. C. Cossor), Mr. I. D. Pullar, A.M.I.E.E. (Air Ministry), Mr. H. Ransome (Directorate of Communications Components Production), Mr. F. D. Redington (Directorate of Communications Components Production), Mr. J. Rhodes (G.P.O.), Mr. E. A. Richards (Standard Telephones & Cables), Mr. J. W. Scott (Clarke, Chapman & Co.), Mr. G. E. Shakeshaft (C.A.V., Ltd.), Mr. J. U. Signer (Richardsons, Westgarth), Dr. C. L. Smith (Telecommunications Research Establishment, M.A.P.), Mr. M. Smith, M.I.E.E. (Ericsson Telephones, Ltd.), Mr. A. H. Thomas (Hoover, Ltd.), Mr. N. A. Twemlow (Radio Production Executive), Mr. W. H. Warman (Radiodiffusion, Ltd.), and Mr. E. S. Wright (Standard Telephones & Cables).

The list of 1,270 civilian awards of the British Empire Medal also contains a large number of names of people in the electrical industry.

Wolverhampton Kitchen Exhibition

The Central England Area Committee of the British Electrical Development Association has organised a three-weeks exhibition of four full-sized all-electric kitchens, specially designed for low-cost homes, at the premises of James Beattie, Ltd., Victoria Street, Wolverhampton. The exhibition will be opened by Sir William Beveridge, K.C.B., on January 22nd.

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE appointment is announced of **Mr. P. V. Hunter,** C.B.E., M.I.E.E., an executive director of British Insulated Callender's Cables, Ltd., as engineer-in-chief of the company.

Mr. Hunter entered Faraday House in 1900 and was subsequently an assistant engineer with Robert Hammond. A year later Mr. Hunter joined the staff of Merz & McLellan at Newcastle, staying with them for fifteen years and becoming the head of their electrical department, in which position he had considerable experience of power stations, waste heat generating stations and railway electrification schemes in South America and Australia.

During the 1914-1918 war he served with the Admiralty as engineering member of the committee specially concerned with the development of methods of location and destruction of enemy submarines.

After this Mr. Hunter joined Callender's in 1919 as chief engineer and later became well known as the inventor of the "split conductor" and "four conductor" methods of automatic cable protection. In 1938 he was appointed a director of the Callender Company.

Mr. Hunter has served on the Council and on committees of the Institution of Electrical Engineers and in 1933 he was elected president. He has been chairman of the I.E.E. Wiring Regulations Committee since 1934 and also chairman of the Executive Committee of the National Register of Electrical Installation Contractors since 1925. He was president of the E.I.B.A. in 1939-41 and he is president of the British Ice Hockey Association.

Other senior appointments announced by British Insulated Callender's Cables are as follows:—

Mr. D. W. Aldridge has been appointed manager (production) and is responsible for the administration of all production matters in the company's factories; he will also deputise for Mr. Hunter in his absence.

In the Engineering and Research Division Dr. L. G. Brazier becomes research manager, Dr. J. L. Miller chief engineer (equipment and telecommunications) and Mr. R. M. Fairfield process manager. In the Production Division Mr. H. J. Allcock has been appointed deputy manager (production); Mr. J. L. Harvey general works manager; Mr. E. Bowyer works manager, Anchor Works, Leigh; Mr. W. J. Clements works manager, Prescot; Mr. H. Hill works manager Erith; Mr. C. Wilkinson works manager (acting), Helsby; and Mr. T. Hewitt refinery manager, British Copper Refiners, Ltd.

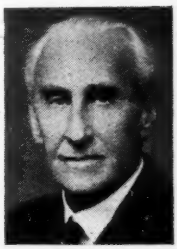
It is also announced that **Mr. N. K. Bunn,** formerly joint general works manager of British Insulated Cables, Ltd., retired from the company's service on December 31st.

Mr. Harold Hobson, chairman of the Central Electricity Board, has been appointed a Fellow of King's College, London University.

Mr. R. J. Willis, after four years' service with the R.A.F. as a technical signals officer, has returned to his position as publicity manager of the Sun Electrical Co., Ltd. Most of his war service was in the Middle East Command, including Cyrenaica, Egypt and Palestine.

The Minister of Supply has agreed to the release of **Sir Geoffrey D. Burton** from his appointment as Director-General of Mechanical Equipment.

The Earl of Lytton has been appointed chairman of the London Power Company in succession to **Mr. O. R. H. Bury,** who had held the position since 1941. Lord Lytton was president of the British Electrical Development Association from 1938 to 1941.



Lord Lytton

Mr. E. W. Simon has been appointed mains superintendent with the Leyton Corporation Electricity Department.

Mr. T. L. Baughan, consumers' engineer and meter superintendent with the Hornsey Corporation Electricity Department, has retired after forty-two years' service.

Sir Clive Baillieu has been nominated for the presidency of the Federation of British Industries for a second year. The Grand Council also recommends that **Sir Guy Locock,** the retiring director, shall be elected a vice-president. At its meeting on January 9th the Council extended a welcome to **Mr. N. V. Kipping** (who received a knighthood in the New Year Honours) the new director.

Lt.-Col. H. G. Campbell, R.E.M.E., is now resuming his duties as director of engineering with Benjamin Electric, Ltd., after six and a half years' absence on active service.

The Birmingham Electric Club gave a party for about 150 children at the Grand Hotel, Birmingham, on January 5th. There were about 190 adults present to share the entertainments, which included a film, a marionette show and a Punch and Judy show.

Mr. J. Bell, M.Sc., M.I.E.E., is relinquishing his appointment with the Admiralty to join Muirhead & Co., Ltd., as chief research engineer on March 1st next. Mr. Bell, who has been chief of the Electrical Group for many years at the

Admiralty Gunnery Establishment, has been associated with many developments including remote indication and transmission units (Magslips). Mr. Bell was educated at Armstrong College, Durham University and gained practical experience in Tyne shipyards and with C. A. Parsons & Co., Ltd.

The appointment of **Mr. W. A. Crocker,** A.M.I.E.E., as city electrical engineer of York was confirmed by a meeting of the City Council on January 8th and he will take up his new duties on March 1st. For the past four years Mr. Crocker has been deputy borough electrical engineer of Birkenhead. A native of Worksop, Mr. Crocker, who is forty-four, was trained at Bradford Technical College and Bradford Electricity Department, where he obtained his first appointment as junior substation engineer; in 1928 he was made assistant electrical construction engineer and substation superintendent. In 1931 he went to West Ham as technical assistant to the distribution engineer, leaving five years later to become substation engineer at Plymouth. From 1938 until he joined the Birkenhead undertaking he served as technical assistant to the Stretford and District Electricity Board.

Mr. W. A. Crocker

Mr. D. G. Rodger has been appointed assistant general manager (commercial) of Johnson & Phillips, Ltd., and **Mr. G. T. W. Whitehead** assistant general manager (works).

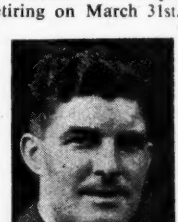
The Central Electricity Board has appointed **Mr. G. R. Peterson,** B.A., A.M.I.E.E., chief assistant operation engineer, head office, to be operation engineer for the North-West England and North Wales Area. Mr. Peterson is a graduate of Clare College, Cambridge, and had a varied training experience in this country before spending some 15 months in the United States in the test department of the General Electric. On his return to this country, he was engaged for some time with Metropolitan-Vickers on power station construction work in the London area prior to joining the Central Electricity Board as an assistant in the Operation Department of the North-East England Area. Having been transferred to head office in 1942, he was seconded in the following year to the Ministry of Economic Warfare in connection with electricity supply in Germany and the occupied countries, and on the completion of this work in 1944 he took up his present post. Mr. Peterson has recently returned from a five weeks' tour of German power stations and electrical manufacturers' works.

Mr. G. R. Peterson

Lt.-Col. H. Butcher, who had intended to return to civilian life this month, is remaining in his present capacity as C.O. No. 5 Port Operating Group, R.E., C.M.F., for a further six months.

Dr. Gano Dunn (U.S.A.) has been elected a vice-chairman of the International Executive Council of the World Power Conference. Dr. Dunn has been president of the J. G. White Engineering Corporation since 1913 and is a past-president of the American Institute of Electrical Engineers. He has been chairman of the American National Committee of the Conference since June, 1945.

Mr. G. H. Sammons, A.M.I.E.E., engineer and manager of the Dewsbury Electricity Department, has been appointed borough electrical engineer of Barnsley in succession to Major E. A. Barker, who is retiring on March 31st. Before his appointment at Dewsbury in 1941 Mr. Sammons was for three and a half years deputy engineer and manager at Blackburn. Receiving his early education at the Birmingham Technical College, Mr. Sammons, who is forty-nine, was before the 1914-18 war successively on the staffs of Veritys, Ltd., the G.E.C., and the Birmingham Electric Supply Department, where after a period in the test room he became mains assistant. He went to Wolverhampton in 1923, becoming assistant distribution superintendent in 1928. In 1930 he was appointed engineering and distribution superintendent at Hampstead, and a year later sectional mains superintendent at Manchester. After three years he went to Grimsby. He was elected to the committee of the I.E.E. North-Western Centre in 1938.



Mr. G. H. Sammons

Mr. W. J. Mason has been appointed electrical engineer to the Associated Equipment Co., Ltd., in succession to **Mr. A. J. Burfitt** who has retired on pension. Mr. Mason received his electrical training with Johnson & Phillips, Ltd., and studied at the Northampton Polytechnic Institute before joining the Thames Iron Works Co., where among other duties, he assisted in the electrical installation work on H.M.S. *Black Prince.* He subsequently served as second maintenance engineer at Hobson & Sons' Army clothing factory and then as public lighting elec-

trician to the Tunbridge Wells Corporation. After being severely wounded in France during the 1914-1918 war, he joined the A.E.C. in 1917 as a charge-hand and was made foreman of the Electrical Department in 1933. Mr. Burfitt began at the Walthamstow factory in 1911, as district electrical foreman, and was promoted electrical engineer in charge of all plant and equipment in 1917.

Fifty years has elapsed since **Mr. Albert Bulpitt** joined his father in the firm of Bulpitt & Sons. Mr. Bulpitt is the commercial director and is responsible for the production of the company's aluminium ware. He has been a director and secretary of the company since it was formed in 1910 following his father's death. Before the war he made a world tour to make personal contact with the company's agents and customers.

Mr. Albert Bulpitt

Mr. L. A. S. Robbins, who has resigned his position as London manager for Archibald Low Electrics, Ltd., which he had held for the past thirteen years, has taken up a similar post with Duncan Low, Ltd., with temporary offices at " Leneth," Morgan Crescent, Theydon Bois, Essex.

Mr. G. S. Edwards has resigned his position as sales engineer and manager, Manchester Branch, Archd. Low Electrics, Ltd., and is now representing Duncan Low, Ltd., in the Lancashire, Cheshire, Derby, Stafford and Shropshire areas.

Mr. and **Mrs. Higgs,** of Higgs Motors, left in the Canadian Pacific steamer *Erria* on January 8th for an extended business tour of North America and do not expect to be back for two or three months.

Mr. G. Windred informs us that on account of health considerations he is relinquishing in a few months' time his position as research and development engineer with the Sperry Gyroscope Co., Ltd. He plans to undertake advisory work in electrical engineering and electronics.

Mr. J. B. Kilshaw, mains engineer at Bolton, has been appointed mains superintendent of the Oldham Corporation Electricity Department. He succeeds Mr. E. Oldale, who has gone to Stockport.

Mr. D. J. Thornton, the London & North Eastern Railway Co.'s district electrical assistant, Norton Folgate (Liverpool Street) retired on December 29th.

At a meeting of the Birmingham Centre of the Illuminating Engineering Society, held at the Imperial Hotel, Birmingham, on January 4th, a " free for all " Brains Trust was held, which meant that any member of the audience could answer questions as well as ask them. Under the able chairmanship of **Mr. F. F. Middleton** this led to an orderly and spirited discussion with a valuable interchange of ideas.

The promotion of **Mr. D. F. Grant,** A.M.I.E.E., chief assistant engineer with the Southport Corporation Electricity Department, to the position of deputy borough electrical engineer has been confirmed. Mr. Grant, who is forty-two, was born at Gravesend and educated at King's School, Rochester, serving an engineering apprenticeship with the Associated Portland Cement Manufacturers, Ltd. In 1924 he was appointed junior engineer to the Loughborough Corporation Electricity Department and two years later became technical assistant at Maidstone. He went to Southport in 1934 as station superintendent and was made chief assistant engineer in 1937.

Mr. J. V. Daniel has been appointed general sales manager of the Plant Division of Crompton Parkinson, Ltd., operating from the London office. He was formerly rotating plant sales manager and at one time was assistant general manager and sales manager of the British Electric Transformer Co., Ltd. (in association with Crompton Parkinson). **Mr. R. T. Pardoe** has been appointed switchgear sales manager, operating from the London office. He was formerly manager of the Birmingham branch.

Mr. E. A. Newburn, borough electrical engineer of Walsall, has been appointed city electrical engineer of Bath at a commencing salary of £1,553. Mr. Newburn was educated at the Doncaster Technical College and Sheffield University, and from 1913 to 1916 was a pupil in the Doncaster Electricity Department. In 1916 he went to Rotherham as assistant mains superintendent and in 1921 moved to Rochdale as deputy mains superintendent. He joined the Walsall Electricity Department as chief technical assistant in 1930, becoming manager of the undertaking in 1934.

Mr. E. A. Newburn

Mr. D. W. Cooper, who in 1942 was seconded from George Cohen, Sons & Co., Ltd., to take up the appointment of Assistant Controller of Machine Tools at the Machine Tool Control and has for the last year been Director of Machine Tool Disposals, has joined the board of the Selson Machine Tool Co., Ltd., one of the group of companies of which George Cohen, Sons & Co. is the parent concern.

Mr. G. W. Lacey, C.B.E., B.Sc., general sales manager responsible for the Sales Division of the British Aluminium Co., Ltd., has been appointed

a member of the board. **Mr. E. A. Langham,** who has recently returned from India, has taken up his appointment as sales manager in the Sales Division. As previously announced, **Mr. A. W. Langham,** who has been acting sales manager and responsible for the Sales and Sales Planning Departments, has now taken up the appointment of sales planning manager.

Mr. W. H. Emery, accountant to the Farnham Gas and Electricity Co., has been appointed general manager and secretary in succession to the late Mr. A. E. Logsdon, who was managing director and secretary.

Mr. J. G. Statter, chairman and joint managing director of J. G. Statter & Co., Ltd., sailed on January 5th for South Africa and Rhodesia, where he hopes to make many personal contacts with present and prospective users of the company's switchgear. Letters may be addressed to him c/o Post Box No. 3797 Johannesburg.

In our last issue we reported the appointment of **Col. E. Gore-Browne** as a member of the Central Electricity Board in succession to **Sir Ralph Wedgwood,** and we now reproduce his portrait. Col. Gore-Browne is chairman of the Southern Railway Co.

Col. E. Gore-Browne

Employees of Elexcel, Ltd., recently presented the pantomime, "Red Riding Hood." A number of well-attended performances were given and the proceeds were passed to the Elexcel Sports and Social Club to be used for their children's party for sons and daughters of employees.

A complimentary dinner party, sponsored by the supervisory staff of Simms Motor Units, Ltd., was recently given to **Mr. John Ayres,** general works manager, on his departure for Leeds to take up the appointment of director and general manager of Flather & Co., Ltd. The toast to Mr. Ayres was proposed by Mr. R. Brealey, managing director of the company.

Mr. E. L. Colston has retired from the board of Hoover, Ltd., and relinquished the position of joint managing director.

Mr. A. E. Judge, A.M.I.E.E., has joined the Technical Sales Staff of the New Insulation Co., Ltd., Gloucester, and will be in charge of the London office.

Mr. N. C. Robertson, M.B.E., deputy managing director of E. K. Cole, Ltd., has been admitted into the livery of the Worshipful Company of Horners, his city guild, with records dating from the thirteenth century, having recently decided to associate itself with the modern industry of plastics.

Obituary

Mr. J. W. Meares.—We report with regret the death at his Bournemouth home on January 11th of Mr. John Willoughby Meares who was for many years one of the leading British electrical engineers in India. Mr. Meares was born at Hadley, Herts., in 1871, and was educated at Winchester College and University College, London, and he was trained at Crompton & Co.'s works, Chelmsford.

In 1903, Mr. Meares was appointed electrical adviser to the Government of India, a position which he held until his retirement in 1922. During the last four years of this period he was also chief engineer of the Hydro-Electric Survey of India and was responsible for several valuable reports upon Indian water-power which later formed the basis of development schemes. Mr. Meares was also representative of India on the International Electrotechnical Commission and the World Power Conference and was for some years local hon. secretary of the I.E.E. in India. He was the author of "Electrical Engineering Practice," in three volumes; "The Law Relating to Electrical Energy in India and Burma"; and "Water Power." He also contributed many articles to the technical press, including the *Electrical Review.* He was a member of the Institutions of Civil and Electrical Engineers and in 1922 was awarded the C.I.E.

Mr. V. M. Rogers.—We regret to learn that Mr. Victor M. Rogers, who was recently appointed manager of the South-West England branch of Berry's Electric, Ltd., met with a road accident in Birmingham last week and has since died. Mr. Rogers first joined Berry's Electric in 1927.

Mr. C. A. Weekes.—We learn with regret of the death on January 6th at a London hospital of Mr. Charles Alexander Weekes; he was in his seventy-ninth year. Mr. Weekes, who was a barrister and a man of letters, was closely associated with the late D. N. Dunlop in the early days of B.E.A.M.A. and was for many years legal adviser and secretary to the Council.

Mr. R. C. Teago.—We regret to hear of the death of Mr. R. C. Teago, for many years attached to the Birmingham branch of Johnson & Phillips, Ltd., as rubber cable salesman.

Generation of Electricity in December

THE official returns rendered to the Electricity Commissioners show that 3,675 million kWh was generated by authorised undertakers in Great Britain during December last, as compared with the revised figure of 3,744 million kWh in December, 1944, representing a decrease of 69 million kWh, or 1·8 per cent. During 1945, the total amount of electricity generated by authorised undertakers was 37,276 million kWh, as compared with the revised figure of 38,356 million kWh for 1944, a decrease of 1,080 million kWh or 2·8 per cent.

Electricity Supply Organisation

Division and Co-ordination of Functions

By G. V. Harrap, A.M.I.E.E., M.I.I.A.*

THE main function of an electricity supply undertaking is not the technical side: it is the duty of giving the community a medium that is better able to perform work than any other. For this it is essential that the business should be efficiently organised.

Engineers are familiar with the facts that to attain maximum efficiency in the operation of equipment, it must be correctly designed, its field of operation accurately chosen, and its capabilities utilised to the fullest advantage. It is not always realised that the same is true of the staff of undertakings. Now that many Service men are returning to undertakings, their original positions should be reconsidered. The organisation might be improved by their employment in positions that use their abilities to better advantage.

The laws of electro-technology are well known and clearly defined. The same cannot be said of organisation, for it is still very largely experimental, and consequently the staffing structure of undertakings is exceedingly varied. Certain clear divisions of function have become stabilised, but the duties of each are not at all clear. This is particularly the case in smaller undertakings, which cannot employ the specialist staff necessary to the proper fulfilment of an undertaking's main service. Regional organisation of undertakings will produce greater specialisation and it will be advantageous if all key positions carry similar duties.

It is becoming necessary in many undertakings for the senior positions to be closely circumscribed in their duties and responsibilities. There is still in many undertakings lack of clear definition of duties of the section heads, who are focal points around which an an organisation is built.

Charge Engineer's Duties

The charge engineer works an eight-hour shift and deals with the difficulties of rotating plant, steam-raising equipment of considerable complexity, and the burning of fuel of greatly varying quality. He has to ascertain whenever any of this plant is faulty and adjust station running conditions to allow for plant to be available for maintenance. The charge engineer has to secure the most economical operation of the plant with the help of combustion and control engineers; this duty comes second only to that of maintaining maximum availability of plant.

He controls a very small staff, though he may be indirectly concerned with a much larger number of maintenance and other men needed to keep the station in efficient operation. The most important man under his control is the junior charge engineer, who is often a young man of high technical quality attracted to engineering rather than to administration. Both these engineers, however, need good organising ability, and their problem is to maintain the successful operation of a complex assortment of civil, mechanical and electrical plant arranged in a compact group using a small number of men.

The Mains Department

The mains engineer's work is practically wholly electrical, except for some small civil and mechanical work on trenches, poles and buildings. The equipment he controls is distributed over a wide area, and he will have a number of assistant mains engineers helping him to control a large number of men. His main work is constructional, for maintenance is normally not so essential or so diverse as it is in a power station. It involves mainly static apparatus, which is extremely reliable in these days, though subject to greater outside interference than any of the plant under a charge engineer. Although he is more fortunate than the charge engineer in working only normal hours, and those of shorter duration, yet his work has to accommodate the varying needs of industrial consumers. He must be available on a stand-by rota during non-working hours, so as to deal with breakdowns on the system. Good organising ability is essential, particularly in the section head.

In many large undertakings there has perhaps been more specialisation on the distribution side than any other, and with amalgamations and nationalisation this tendency will grow. One of the first subdivisions is the creation of a planning subsection dealing with the issue of instructions for

* Mr. Harrap has just been appointed borough electrical engineer of Gravesend.

constructional work, the ordering of material, securing of consents, and negotiations with consumers. This subsection may be split into e.h.v. and l.v. divisions, and may be linked with a separate technical section determining standards of equipment to be used by the undertaking. There may also be substation, maintenance and protection subsections. The employment of distribution control engineers is growing, and in large undertakings is essential. The purpose of these subsections is to secure better organisation by allocating separate functions to specialists.

Contacts with Consumers

The sales engineer has most contacts with consumers, and his duties include sales and showroom control, development of utilisation, and installation work for consumers. Control of the meter staff is sometimes under this engineer, and the calibre of his men varies from specialised engineers to non-technical representatives. This section may have the largest staff of any, but it will work in a large number of small groups. Although the capital value of individual equipment handled by the section is low, the turnover is considerable, and effective control requires good organising ability. The sales engineer is concerned with costing and estimating items, usually small but numerous. He has little control over the efficiency with which electricity is delivered to the consumer, as distinct from the charge engineer and the mains engineer. His section is frequently subdivided into many specialised parts, particularly where urban and rural areas are supplied by the undertaking. The working hours may be irregular to suit the public's needs, and he frequently has to attend meetings outside normal office hours, and help to organise special functions for the many trades within the undertaking's area.

Where an undertaking is not of sufficient size to have many subsections, a technical assistant may be employed. Practice differs widely: such an assistant may be attached either to the manager or to the individual section heads. If attached to the latter, he tends to become too specialised, especially if he lacks practical experience. When he is directly responsible to the manager, or the latter's deputy, he is a most important member of the organisation, and his value is greater if he has previously secured organising experience in one or more of the main sections. He will usually deal with the technical side of new work, investigate breakdowns, and advise other sections on major schemes. He will deal with costs of production, standardisation of equipment, estimation of revenues and interpretation of agreements, and he will handle disputes. This work gradually produces the ability to cope with organisation and administrative problems, as distinct from those of a purely technical character.

The individual known variously as chief clerk, secretary, administrative officer, or even comptroller, is the last to be considered; not because he is lowest in status or value, but because he is the one section head who is not primarily an engineer. In peacetime he dealt almost solely with financial matters, but stores control, purchase of fuel, equipment and material sometimes come under him.

During the war, this officer's responsibilities have covered matters affecting the whole undertaking, as distinct from the sectional features controlled by the engineers. Problems of manpower, national service, reinstatement and the operation of the many Government controls have all, for better organisation, been under his control. There can be no objection to this practice if the result is increased efficiency of the undertaking's primary function.

Future Control

If regional boards are set up, upon which will be the engineer-managers of all constituent undertakings, each board will have a secretary to organise meetings, record decisions, and issue instructions about requisite actions. He may be one of the present day administrative officers who, being the one permanent member of the board, may gradually assume its direction and control.

The last-mentioned evolution would be regrettable from the engineer's point of view, but would it harm the industry? The two largest J.E.A.s are controlled by a "Clerk," and a number of the biggest undertakings are managed by "clerical" men. Does the undertaking lose, or only the engineer? The best managers for electricity supply are those who have been trained to think clearly and logically and possess the sound judgment that is gained in engineering. Have we got such men, and are they being trained to take the place of those now retiring? The nationalisation of the industry will soon be upon us. Is it certain that after it is all over the engineer will still be in control? Perhaps —but only if he deserves it!

Plugs and Sockets

Conditions to be Met in Small Post-War Houses

By J. F. Field, B.Sc., A.M.Inst.C.E., M.I.E.E.

WHEN B.S. 546 was introduced in 1934, it standardised pin diameters and centres in common use for several years, but it took some time to catch on, and indeed the 2-A plug and socket never has caught on. Large numbers of existing houses had been provided previously with the older 5-A two-pin type. As they had wooden floors and were built primarily to use coal fires, from a safety aspect the earth pin did not matter much. Many had provision for comparatively quick connection of gas fires, but electric fires generally meant additional wiring from the main distribution point. Gas interests used the argument that it would be unnecessary to equip the houses electrically for anything more than lighting with, say, one 5-A plug in each room for a vacuum cleaner or a wireless set.

Mr. Field is engineer and manager of the Edinburgh Electricity Department

Such an electrical installation, being cheap, appealed to the speculative builder, with the result that very large numbers of houses built between the wars were not adequately wired, although the inhabitants are using electric fires up to 2-kW rating from 5-A two-pin plugs. Many of the installations had 0·044-in. conductors, which are now carrying loads up to 2 kW, apparently quite safely.

Recent 13-A Types

I would like to direct the attention of electrical contractors to this point. It is not necessarily what should have been; it is actually what has happened. The overwhelming majority of the vast number of electric fires installed before the war were for 2 kW or less. This is relevant to the proposal to introduce a 13-A universal domestic plug, because 2 kW at 230 V represents only 8·7 A.

In the early part of 1944 there appeared a 13-A plug and socket of a new design. The question of uprating the 5-A plug to 13 A had not then, I believe, been mooted, because the 3-kW fire was regarded as a rarity. Any advantages possessed by the new plug over the best makes of B.S. 546 15-A plugs appeared to me to be offset by disadvantages, one of which was that the pin being in ceramic material at the base seemed liable to break off.

A plug of apparently similar design has been tested recently along with some of the B.S. 546 5-A plugs of various makes at the Institution of Electrical Engineers. Press reports indicate that in carrying 13 A the combined fuse and pin became hotter than I consider desirable. This is what I should have expected as a consequence of the form of screw-in contact established by the fuse (which, incidentally, is only finger-tight) where it is attached to the live lead terminal of the plug.

Provision for Ring Main Wiring

A good feature of a later model I was shown is the special provision for ring-main systems of wiring, which allows for stripping the phase and neutral leads of insulation only and running them straight through the back of the socket unit. Proper provision for ring-main systems is in itself desirable—certainly for all purposes combined, other than lighting. It is easy, however, to cater for this with existing designs by means of short insulated conductor pins arranged to clamp on to each conductor which could be stripped ¼ in. for this purpose.

Personally I would like to try including lighting on the ring-main power circuit with individual 5-A cartridge fuses at each lighting switch, leaving any major wiring fault to be cleared on the back-up fuse or overload-and-earth-leakage device at the main distribution point. Light failure with this type of fault would probably be no more frequent than at present. Like most other electricity supply authorities, we in Edinburgh have an emergency fuse renewal service.

Failure of lighting circuits would not necessarily be more common with a 100 per cent. ring-main system, provided the rating of the back-up fuse or other device protecting it were set substantially higher than any fuses fitted to plugs of appliances. Fuses are

always a bit of a nuisance and, apart from the question of a universal plug, all devices carrying a current of more than 5 A should not, in my view, be fused locally. If a fault developed in such an appliance there would be no great hardship in allowing the fault to be cleared at the main supply point. Those who disagree with me could still keep the lighting on a separate circuit, but it would not be so economical an installation.

The Ministry of Works' approach to this problem, as given in its document PWR/52/37 of May 24th, 1944, is interesting to the student of plugs and sockets, having regard to the present situation. In Item 1 the Post-War Building Electrical Committee of the Ministry unanimously concluded that an effort should be made to standardise a single size and type of socket outlet and plug for the smaller type of house. Like every other desirable thing, this should not, however, be obtained at too high a cost in other directions.

The Committee's second point was that the present position was not satisfactory, and again one is inclined to agree, especially in view of the vast quantity of two-pin plugs and sockets still in use on unearthed appliances and still listed in catalogues. If the 5-A three-pin plug and socket had already been practically universal the situation would not have been anything like so confusing to the public. They would have expected a three-pin 5-A plug on every appliance they bought instead of either no plug at all or a somewhat complicated gadget consisting of a two-pin plug connected inside a lampholder adaptor, as still sold with some kinds of domestic appliances: so Paragraph 2 of the Committee's observations does not necessarily indicate that a new standard is required.

Rating of Appliances

Paragraph 3 contains, in my view, the answer to the present situation. The Committee says that it was "impressed by the evidence produced that few, if any, portable appliances of more than 2-kW rating were in use in smaller houses, and that moreover the small size of the rooms made it unnecessary and even uncomfortable to use an electric fire of more than this rating." In this connection some of the British 5-A B.S. plugs have already been rated at 10 A in Australia and this could be done in this country, but statutory authority should be sought by electricity supply authorities to refuse or cut off a supply if plugs and sockets do not conform to certain standards of performance as ascertained by a national proving house. There seems no doubt that the Committee was satisfied that a 10-A rating would be sufficient. In regard to existing 5-A socket outlets with switches, the best solution for AC circuits would be to short-circuit or remove the switch, which according to I.E.E. Regulations and ordinary experience is not necessary.

On the first page of the document the adoption of the ring-main system is recommended in the interests of economy and flexibility, as has been done in new permanent Swedish houses. The advantage of retaining an existing standard for the proposed 10-A rating is mentioned. Considering the vast number of two-pin installations still in use in houses built up to as late as 1935 and that some 17 million 5-A plugs and sockets to B.S. 546 have been installed in British homes during the past twelve years with a further almost equal number of the 15-A size, the introduction of a new standard cannot be expected to clarify the position. The great majority of these 5- and 15-A plugs are giving excellent service, and there is no reason to scrap them, particularly at this time of scarcity. The introduction of a new standard will not eliminate the existing standard any more than the existing standard succeeded in eliminating the vast number of two-pin plugs and sockets still in use.

E.C.A. Objection

Regarding the objection of the Electrical Contractors' Association to up-rating the existing 5-A standard because it might overload the wiring, the war emergency relaxations of the I.E.E. Wiring Rules permitted the up-rating of gauges of domestic wiring; for example, 3/·029 has been upgraded to 10 A continuous rating. On the other hand 1/·044 with three-quarters of the cross-sectional area is still restricted to 5 A, but it need not be, for the only limit up to 10 A is increased voltage drop, which is small in comparison with the variation of something like ±14 V which is now allowed on mains. The main point is that this form of abuse exists anyway, although it could be forbidden on all new installations by insisting on, say, 7/·029 conductors.

The remarkable feature of the Ministry of Works memorandum is that after reviewing the whole question objectively up to and including item 9, it states in item 10 as a kind of afterthought that there was "later evidence submitted to them from other parts of the country that 3 kW is sometimes required."

This is where I think the whole subject has become confused. Fires of 3-kW size are likely to be exceptional in any small house of the type now to be built in large numbers all over the country. The questionnaire enclosed with the memorandum was, it seemed to me, so worded as to invite replies in support of a new standard 3-kW round-pin plug, the fuse being in the plug.

Nevertheless the manufacturers who sponsored the B.S.I. proposal last September to up-rate the existing 5-A standard to 13 A appear to me to have been wrong in ignoring E.D.A. and the I.M.E.A. On the other hand I think these two bodies have been unduly critical of the manufacturers' very legitimate interest in this matter. The manufacturers' reasons for wishing to retain existing standards and extensive tooling facilities are entirely reasonable. Most of them can get into mass production of the existing 5- and 15-A rating with little delay, given reasonable freedom and labour to do so. There would necessarily be a serious delay in tooling up for a new standard that would have to be life-proved before being finally put into production. That would be worth while only if it possessed overwhelming advantages that are not apparent to me.

I consider therefore that the best solution is to up-rate the B.S. 5-A plug to 10-A and to leave the fuse in the back of the plug, the largest fuse allowed being 5-A, and shorting out the local fuse for higher ratings.

The present price levels for plugs and sockets, however, require careful consideration. These are some 60 per cent. up on pre-war figures, and should be capable of reduction. Moreover the 15-A size costs approximately 25 per cent. more than the 5-A. This cannot be due to the difference in the number produced, because manufacturers have stated that practically as many 15-A as 5-A plugs and sockets have been made since B.S. 546 was introduced. The cost of manufacture must be almost the same in each case, except for the small additional amount of raw materials used. The existing 15-A rating should be retained and possibly extended to a higher figure as special provision for the occasional appliance of 3 kW and over.

Forthcoming Events

Saturday, January 19th.—*Bristol.*—Merchant Venturers' Technical College, 3 p.m. I.E.E. Bristol Students' Section. "The Measurement and Reduction of Noise," by Dr. A. J. King.

Monday, January 21st.—*Liverpool.*—Royal Institution, Colquitt Street, 6 p.m. I.E.E. Mersey and North Wales Centre. "Recent Progress in the Design of the High Voltage Overhead Lines of the British Grid System," by W. J. Nicholls.

Bradford.—Technical College, 7.15 p.m. Bradford Engineering Society. "Electric Driving," by G. W. Edeley.

Birmingham.—Grand Hotel, 6 p.m. Electric Club. "Electronics applied to Detection, Measurement and Microscopy," by Dr. W. Wilson.

Tuesday, January 22nd.—*London.*—School of Tropical Medicine, Gower Street, 7 p.m. Society of Instrument Technology. "Electronic Controls for Resistance Welders," by B. G. Higgins.

Manchester.—Engineers' Club, Albert Square, 6 p.m. I.E.E. North Western Centre. "The Localisation of Faults in L.V. Cables with Special Reference to Factory Technique," by J. H. Savage.

Glasgow.—Royal Technical College, George Street, 6.15 p.m. I.E.E. Scottish Centre. "The Operation, Maintenance, and Testing of Overhead Lines and Associated Outdoor Equipment on A.C. Systems," by R. C. Hatton and J. McCombe.

Wednesday, January 23rd.—*Aberdeen.*—Caledonian Hotel, 7.45 p.m. I.E.E. Scottish Centre. Meeting as above (Glasgow).

Thursday, January 24th.—*London.*—Institution of Electrical Engineers, 6.45 p.m. Joint meeting (partly by radio link) with the Institute of Radio Engineers (America). "An Introduction to Hyperbolic Navigation," by J. A. Pierce.

Friday, January 25th.—*Newcastle-on-Tyne.*—County Hotel, Neville Street, 3 p.m. Electrical Industries Benevolent Association (Northern Counties Area). Annual general meeting.

London.—Institution of Electrical Engineers, 5.30 p.m. I.E.E. Measurements Section. Discussion on "Instruments for Special Purposes," to be opened by R. W. Griffin.

Institution of Mechanical Engineers, Storey's Gate, S.W.1, 5.30 p.m. Extra general meeting. "Recent Developments in AC Turbo-Electric Ship Propulsion," by G. O. Watson.

Saturday, January 26th.—*Glasgow.*—Royal Technical College, George Street, 4 p.m. I.E.E. Scottish Centre. Repetition of presidential address by Dr. P. Dunsheath.

Monday, January 28th.—*London.*—Institution of Electrical Engineers, 5.30 p.m. Informal meeting. Discussion on "Electrical Aids to Coal Production," to be opened by R. Crawford. 6), Greencroft Gardens, N.W.6, 7.15 p.m. Association of Austrian Engineers, Chemists and Scientific Workers in Great Britain. "Electric Networks," by Dr. W. Saraga.

Cardiff.—Park Hotel, Park Place, 6 p.m. I.E.E. Western Centre (Installations Group). Dinner meeting.

Newcastle-on-Tyne.—Neville Hall, Westgate Road, 6.15 p.m. I.E.E. North Eastern Centre. "Stray Losses in Synchronous Electrical Machinery," by P. Richardson.

COMMERCE and INDUSTRY

Wages and Salaries.

Electricians' Wages

OWING to the negotiations now proceeding between the E.T.U. and the N.F.E.A., the operation of Clause (3) of the Wages (War Adjustment) Agreement, dated November 24th, 1939, has been temporarily suspended. As from the third pay-day in January therefore, and until further notice, the addition to the bare time rates as specified in the agreement will remain as at present, viz.:

Areas	Basic rate	Cost-of-living war addition (including temporary addition)	Inclusive hourly rate
Grade "A"	1/11¼d.	8¼d.	2/7½d.
Mersey District	1/9½d.	8¼d.	2/5¾d.
Grade "B"	1/8¼d.	8¼d.	2/4½d.
Grade "C"	1/7½d.	8¼d.	2/3¾d.

The proportion of the addition payable to male labour under 21 years of age (except Category I) will remain as follows:—Between 18 and 21, 5¼d. per hour; under 18 years of age, 2¾d. per hour. These amounts are to be added to the basic rates.

Power Engineers' Salaries

As the average of the cost-of-living index figures for the last six months of 1945 was not sufficiently above that of the preceding period to necessitate an adjustment, the schedule of salaries for electrical power engineers remains unaltered. The figures given in the *Electrical Review* of January 12th, 1945, will therefore continue to apply until June 30th.

I.M.E.A. President on Nationalisation

Speaking at a West Hartlepool Corporation luncheon, Alderman Sir William Walker, president of the Incorporated Municipal Electrical Association, deprecated any plan of nationalisation which would mean the introduction of a purely Civil Service element as against an existing body of experienced men. He hoped that nationalisation of the electricity industry would not bring about drastic changes. Men of experience who had carried on municipal undertakings for many years were quite capable of continuing their services, and the Government should make use of the administrative machinery which had grown up with the electricity undertakings.

Service to the Public

In order to show how well the group of companies controlled and managed by the Metropolitan Electric Supply Co. serves the public a four-page pamphlet has been published by the company. In this it is stated that the group has made electricity readily available to 92 per cent. of the premises in its area of supply. Particular attention has been paid to the domestic consumers and during 1944 those taking a supply on two-part tariffs obtained it at an average cost of 1·35d. per kWh. The poorer classes of consumers taking a supply through slot meters paid only 1·16d. per kWh and their consumption averaged 2,124 kWh. Reference is made to the facilities provided by the companies to enable domestic consumers to obtain installations and apparatus and to the advance made in sales of electricity during the years from 1934 to 1944, in spite of the fact that for half of this time the country was at war.

Home Laundry Film.

New E.A.W. Film

"'Twas on a Monday Morning" is the title of a new film which the Electrical Association for Women has just produced to demonstrate the application of motion study in laundry work. Running for about 20 minutes, the film first shows a housewife engaged in a washing-day as undertaken in the average home. Then follows a demonstration of how with a planned sequence of operations, accompanied by the use of up-to-date electrical appliances, the drudgery is removed and the job is accomplished with the minimum of effort and in the least time. The correct way to use the washing machine, wringer and drying cabinet is shown, together with the advantages of the plate-type ironer for general purpose ironing, the ordinary hand iron being reserved for the final touches. The film closes with hints on making the best of facilities already available until more electrical labour saving appliances appear.

Amateur Radio Transmitters

The Postmaster-General announces that the equipment of amateur operators of wireless transmitters (some 5,500 in number) which was taken into custody at the outbreak of war is about to be returned to its owners. The issue of fresh licences (upon application) will commence shortly for operation with powers up to 100 W at 28-29 Mc/s and up to 25 W at 58·5-60 Mc/s; other bands of frequency may become available when released by the military authorities. New conditions governing the issue of licences and technical qualifications required will be fully explained in a leaflet shortly to become available (upon application) from the Engineer-in-Chief, Radio Branch, General Post Office, London, E.C.1.

Vocational Training Scheme

A comprehensive scheme of education and vocational training up to the age of 21 has been planned for all boys entering the works of the Tube Investments group. It will be administered at each of the larger works by a specially-appointed training officer and a training committee, consisting of representatives of the management and the employees, whose task it will be to watch the development of each boy individually and advise on his course of study and future training. Employees under 16 will devote a full working day a week, with pay, to general education, including physical training, the group paying the fees. Boys who show diligence will be given an additional week's paid holiday in the summer, preferably at an organised camp. Opportunity will be found for

them to visit various works, and they will be given elementary talks on the structure of their own industry.

At the age of 16, employees, including new recruits from school, will be given the opportunity of full vocational training until they have reached the stage when it is agreed that experience at work suitable to their ability is all that is required to complete their efficiency. This stage, it is anticipated, will be reached at various ages, from the boy suitable for unskilled work only, to the young man of 21, who will be in the middle of his university career; but pains will be taken to make the unskilled type as versatile as possible. The trainees, on the recommendations of the training committee, will be placed initially in one of the following four courses:—Commercial, craft and technical, draughtsmen or tube mills.

If the boys show that they cannot benefit by further theoretical education, their training will be confined to the practical side. A close watch will, however, be maintained by the Training Committees for those who may develop at a later stage. For those showing the qualities and aptitudes for supervisory work, training will not stop at the age of 21. It will consist of company courses, progressive appointments in various departments in various subsidiary companies, and full opportunity to attend courses at technical colleges and universities.

Fluorescent Store Lighting

New lighting schemes are being undertaken at two well known London stores (Bourne & Hollingsworth, Ltd., Oxford Street, and Swan & Edgar, Ltd., Piccadilly), and in both schemes "Osira" fluorescent tubes form the basis. The colour of the light provided is "intermediate white" which is suitable for colour discrimination though not for very accurate colour matching. In the Bourne & Hollingsworth

Fluorescent lighting at Swan & Edgar's

installation eighteen units, each comprising three tubes 8 ft. 6 ins. long, are employed to light an area devoted to the display of artificial flowers for dress decoration. In the ladies' hosiery department of Swan & Edgar's there are nine fluorescent tube units (three tubes per unit) spaced 9 ft. 6 in. apart. In both installations the intensity at counter level is from 30 to 35 ft.-candles; the loading is approximately 10 W per foot of tube.

Transporting a Submarine Cable

A submarine cable, 49 miles long and weighing 121 tons was recently carried by the Great Western Railway from London to Cardiff, 145 miles, for shipment to Malta. The cable was coiled in seven open wagons and the loop from one truck to the next was protected from rubbing by slats of wood and hessian. To ensure the trucks were not uncoupled until the cable was off-loaded at Cardiff they were fitted with a special clip—first used when a similar cable for the North African landings was carried from London to Newport in 1942. The cable was under observation throughout its journey.

Fan Makers' Meeting

An interim general meeting and luncheon were held recently by the Fan & Allied Manufacturers' Association. Mr. Geoffrey Woods (Woods of Colchester, Ltd.), the chairman, presided, and among those present were Mr. A. W. Berry of the British Engineers' Association, and Mr. V. Heal, F.R.I.B.A., Master of the Worshipful Company of Fan Makers. Mr. Woods surveyed the history of fan making and dealt with the Association's recent activities. He said that the membership had increased and the Technical Committee was pursuing matters of interest to the Association and to the whole fan industry.

Bruce Peebles Wartime Activities

"Achievements 1939-1945" is the title of a 32-page booklet issued by Bruce Peebles & Co., Ltd., to indicate the wartime accomplishments of the company. The publication is in two parts. The first part gives a brief survey of the company's activities, while the second deals with the leading peacetime products, notably, rotating electrical machinery, transformers, rectifiers, and welded steel structures.

Municipal Trading at Dover

Dover Town Council has approved a proposal to conduct sales at the electricity showroom and carry out wiring, etc. A letter was received from the Electrical Contractors' Association asking if a representative could appear before the Electricity Committee to express the Association's views, but the Committee felt that no good purpose would be served by the suggested interview and that the Corporation should proceed to exercise its full powers under the Electricity Supply Acts, 1919 and 1926, setting aside the voluntary limitations placed on the undertaking by a resolution of the Council in 1935. Alderman Brazier said that they were in

the midst of big developments in the building of houses and the Electricity Department wanted to do its own wiring and set a standard for electrical equipment. It was very pleased to work with the electrical contractors and co-operate with them in every way.

F.B.I. and Nationalised Industries

In a statement on national financial policy sent to the Chancellor of the Exchequer by the Federation of British Industries the view is expressed that if the financial results of nationalised enterprises are to be intelligently appreciated they must be separated from the general Budget and be drawn up on a proper commercial basis. Moreover, nationalised industries should make a fair contribution to the national finances; otherwise the sections of industry left under private ownership and the general taxpayer will be called upon to bear a greatly increased burden of taxation.

The Federation welcomes the Chancellor's statement that he is anxious to remove excess profits tax but expresses the hope that no new tax will be devised to take its place. It is considered that the increased buoyancy of business which would be engendered by the removal of E.P.T. would yield increased revenue.

Trade Publications

Londex, Ltd., 207, Anerley Road, London, S.E.20.—Illustrated leaflets describing stepping selector and impulse relays (No. 106) and photo-electric equipment for circuit control (No. 108).

Mitchell Engineering, Ltd., 1, Bedford Square, London, W.C.1.—Stiffly bound brochure of 64 pages describing and illustrating, partly in colours, steam generators for power stations and industrial plant, using either stokers or pulverised coal, including water tube, Loeffler and transportable boilers, coal-handling plant and water cooling towers. Copies obtainable from I.E.D.A. Publications Department, Stanground, Peterborough.

Applicants for copies of these publications should write on their firms' business notepaper.

Contract Price Adjustment Formulæ

The latest figures for the B.E.A.M.A. contract price adjustment formulæ are as follows:—Rate of pay for adult male labour at January 12th, 95s. Costs of material: the index figure for intermediate products last published by the Board of Trade on January 12th is 181·8 and is the figure for the month of December.

Lead Supplies Restricted

As was forecast in an article in our last issue restrictions are being placed on the supply of lead and the price is being raised. The Ministry of Supply announces that owing to the world shortage of lead it is necessary to restrict deliveries of the metal by the Non-Ferrous Metals Directorate to consumers of over two tons a month. These consumers will be rationed on the basis of the average monthly consumption of lead in the four months from September to December, 1945, and for the first quarter of this year, including January deliveries, the proportion will be 80 per cent. Issue of licences, with this restriction, for unwrought lead of guaranteed 99·97 per cent. lead content is to be resumed. Applications for licences for unwrought lead of less than 99·97 lead content and for scrap lead should be made on the basis in force before December 14th, 1945.

An increase of £9 per ton was made in the price as from January 15th, making the price £39 per ton for pig lead and £40 10s. for "English" lead. Up to January 28th holders of valid licences granted before January 15th, on application to the Directorate (Grand Hotel, Rugby), may purchase lead at the former maximum prices.

Calendars

Two-monthly sheets bearing good pictures of installations of the company's turbo-alternator plant in this country and the Dominions form the 1946 calendar of C. A. Parsons & Co., Ltd.

W. H. Sugden & Co., Ltd., have sent us a calendar with boldly-figured monthly sheets with space for memoranda.

"Under Observation," a picture of two rough-haired terriers looking at a goldfish bowl, illustrates the calendar of the Alpha Manufacturing & Electrical Co., Ltd.

Six months' dates at a glance are given by a striking calendar of the Wellman Smith Owen Engineering Corporation, Ltd. Particulars of the company's products are given on the back in English, French, Spanish and Russian.

Trade Announcements

To give better service to its customers in the North, Standard Telephones & Cables, Ltd., have opened a cable and wire store at No. 70, Mosley Street, Manchester, 2, under the managership of Mr. H. Walker. The telephone number is Manchester Central 7607/8; and the telegraphic address "Microphone, Manchester."

The London office of the Brush Electrical Engineering Co., Ltd., and Brush Coachwork, Ltd., will be moved on January 23rd to Duke's Court, 32, Duke Street, St. James', London, S.W.1 (telephone: Whitehall 6177; telegraphic address: "Magneto, Piccy, London").

The Eralite Manufacturing Co., Ltd., has moved to 194, The Broadway, Wimbledon, S.W.19 (telephone: Liberty 6204-6).

The Publicity Department and certain sections of the Sales Department of the Lancashire Electric Power Co., have been moved from Manchester to Memorial Buildings, Memorial Road, Walkden, near Manchester (telephone: Walkden 2631).

The London office of Glenfield & Kennedy, Ltd., and of their associated companies, the British Pitometer Co., Ltd., and Hydrautomat (1931), Ltd., has been moved to 105, Park Street, W.1 (telephone, Mayfair 0142-3-4.)

Fillingham & Co. (E.C.A.), electrical contractors, Railway Road, Urmston, Manchester, have acquired shop premises at 88, Flixton Road, Urmston, and have moved to this address (phone, Urm. 2581).

Changes of Name

The name of Manchester Transformer Oil Ltd., has been changed to Puremor, Ltd.

Electrotest, Ltd., has been renamed Electronic Instruments, Ltd.

Installation Work

Architect, Engineer and Client

AT last week's meeting of the Installations Section of the I.E.E. the paper by Mr. W. R. Watson on "The Control of Electrical Installation Work" (*Electrical Review*, January 11th, p. 62) was read and discussed.

MR. A. F. PLUMMER (Shoolbred Electrical Co.), who opened the discussion, said that the size of job which the author visualised did not often come the way of the ordinary electrical contractor. Not many small contracts could be controlled in the manner suggested. He was rather disturbed by the statement that the electrical engineer or consultant might, in certain circumstances, order materials. Too little space in the paper was devoted to site supervision. Not all consulting engineers were experienced electrical engineers and although the work of such men on paper was beyond reproach, they never went on to the site to see their theories put into practice. The contractor, therefore, welcomed an electrical consulting engineer on the job.

MR. R. H. RAWLL (Birmingham Electric Supply Department) said that the present position was due to lack of direct contact between the electrical engineer and the client, and to the fact that electrical contracts were sub-contracts. He suggested that the Institution should get into touch with the architectural associations and request them, in a friendly manner, to point out to their members the necessity for the electrical engineer to be brought in during the early stages and for the job to be carried out co-operatively. Site meetings were very important, but must not degenerate into mere discussions of details. Minutes of site meetings should be circulated to the people concerned to ensure that what was decided was carried out.

An Architect's Views

MR. S. A. HEAP (R.I.B.A.) expressed his sympathy with the author's views, but pointed out difficulties. If the electrical work on a large building was not to be a sub-contract the same principle would have to be applied to all other sections of the work and a considerable amount of confusion might ensue. The present system of sub-contracting had arisen from long experience and the main contractor was the one central authority for the whole of the work. He agreed that it would be unwise of an architect, in the case of a job involving a large amount of electrical work, not to get into touch with a qualified electrical engineer. He believed the practice in Scotland was to make the sub-contractors responsible to the architect, although he was told that this tendency was now drifting towards the south.

MR. H. M. WINSTANLEY (Handcock & Dykes) did not think it was a good thing for the electrical contractor to draw up the specification. The best method would be for the contractor to approach his Association and get them to nominate a competent person to draw up a specification, and the fee of this person would be included in the tender. If competitive tenders were called for, they would then all be on the same basis. He favoured the sub-contracting of electrical work, but not the preparation of bills of quantities because of the difficulty of covering everything.

North American Practice

MR. E. A. PINTO felt the paper gave an unduly pessimistic picture of the position as it was before the war. He believed that clients were more wide awake and more businesslike than the author gave them credit for, particularly in the case of large jobs. He had just returned from four or five years in Canada and the United States, where he had been dealing with contracts. There was one system of tendering in use there which was not altogether unknown here, the management fee plus cost system, and that was not "cost plus," which enabled an unscrupulous contractor to increase the cost in order to make more profit. The management fee plus cost system saved an enormous amount of work because only the successful tenderer had to go into all the details of quantities. Under this system he had seen a contract for a fair size township, including all electrical services and a pumping plant, lock gates, etc., which covered only one and a half typewritten pages, and it was as tight a contract as could have been wished for.

MR. G. W. MOLLE said that if an electrical job, whether large or small, was placed in the hands of a qualified electrical engineer at the start and he dealt with it right through, then he did not think any trouble need arise. Organisation on large jobs consisted of 80 per cent. diplomacy and 20 per cent. technical knowledge. He did not think there need be

any objection to an electrical contractor being a sub-contractor provided he received his instructions from, or was closely in touch with, a qualified electrical engineer. Unfortunately, it was far from the rule for an exchange of information on all aspects to be made at the earliest stage. With regard to progress charts, he had found miniature plans very useful. A lump sum contract with a really good schedule for variations was the best. A detailed bill of quantities was good in its way, but it was very troublesome and involved a great deal of detailed work. Site supervision was the hub of the whole thing.

MR. O. C. WAYGOOD said that in the case of buildings of the size referred to by the author, the client must, in the first instance, discuss his problems with an architect, and if that architect was a wise man he would simply act as a co-ordinator. Electrical engineers should be strong enough to force their views on matters affecting the electrical installation. During a recent visit to the United States he had been impressed with the co-ordination that existed between the architect and all the experts concerned on a job.

MR. E. P. S. CATTELL said his experience had been that the contractor's job on the site called for 30 per cent. electrical knowledge and 70 per cent. knowledge of general building work and lay-out. Co-ordination was the work of the consultant, but the electrical contractor must be on the job from the very beginning to ensure that he was afforded facilities for getting his services in.

The chairman (MR. J. F. SHIPLEY) said that having had a little experience of contracting, some of manufacture and some as a consultant, his view was that the architect or co-ordinator or whatever he was called must give decisions and take responsibility. It might be necessary for the engineer to correct mistakes by the architect.

MR. WATSON, in the course of a short reply to the discussion, said that many of his points had application to small jobs as well as large ones. Speaking of architects, he said he had worked with a great many and had never failed to get them to appreciate his point of view. He agreed that the system of sub-contracting was an easy way out of an awkward situation, and it was also very convenient to have one organisation on the site to which reference could be made, but he still maintained that too much responsibility for much of the technical work devolved on the main contractor, although theoretically he was supposed to be carrying out all the work.

Transformer Standardisation

Interchangeability While Retaining Manufacturers' Detailed Designs

SOME measure of national standardisation in the transformer industry would benefit both users and manufacturers, says MR. A. G. ELLIS (Metropolitan-Vickers Electrical Co., Ltd.) in a paper presented to the Transmission Section of the Institution of Electrical Engineers.

It is suggested that an effort should be made effectively to standardise supply system requirements, including ratings and electrical performance, as a natural precursor to rendering dimensional and design standardisation a practical proposition. The author then outlines the manner in which fundamental (external) dimensions might be standardised to render complete transformers (distribution and medium-size power types) of the same rating, but of different makes, interchangeable without individual manufacturers having to forego their own detailed designs or production techniques; but it would necessitate changes in standard drawings and tools.

Standardisation of the principal fittings, particularly the fixings and the main dimensions of terminal bushings and cable sealing boxes, would be of great convenience and should be possible. Standardisation of internal dimensions and the principal internal components of transformers would be of assistance to users, particularly overseas. It would, however, be difficult to achieve under present conditions. Detailed design standardisation is not necessary or feasible under the present organisation of the transformer industry, but might become so if the industry were at any time reorganised, for example on more concentrated lines, involving allocated or centralised manufacture.

The case for standardisation and the degree to which it is practicable are closely interwoven with the rationalisation of manufacture as well as the pattern of the future production plan of the twenty British makers, who should plan jointly with other interests concerned.

Electrical Instruments

Varied Display at Magnet House

A COMPREHENSIVE display of measuring devices and indicating instruments which has been on view this week at Magnet House represents one range of G.E.C. manufactures of the General Electric Co., Ltd., which Mr. T. W. Heather (sales director) explained is already actually in production in anticipation of expected expansion of both home and overseas markets.

The extensive range of "Salford" apparatus exhibited is all produced under the direction of Mr. H. Cobden Turner, with Mr. F. R. Unwin in charge of sales development, in a group of seven factories whose employees have multiplied eightfold in seven years.

The display may be divided into four groups: the first comprised standard voltmeters and ammeters, including 1·5, 2 and 2·5 in. sizes, moving-iron, moving-coil, thermocouple and metal-rectifier types. A feature of dynamometers for the precision testing of watthour meters is the unusual way in which their current ranges are changed by a patented link system, chosen by screwing down non-detachable nuts with a key. Beside bridge-circuit comparators of resistance, impedance and capacity, there is a general purpose "Selectest" set with multi-ranges which fulfils the functions of several separate instruments.

Factory Aids

The second group is of more recent origin. They are intended to be used in factories by adept, though not greatly skilled operators, who merely watch the degree of swing of a pointer or change of shape of a diagram on a cathode-tube screen without needing to calculate or interpret scale figures.

The speed with which specimens can be tested with the aid of some of these newer instruments is remarkable; 10,000 aero-engine bolts tested in four hours and a sufficient number of another small aircraft component for a whole year's use tested in one day are examples of the performance of the magnetic sorting bridge [1] which is mains energised and utilises a cathode-ray oscilloscope to indicate (by comparison with the hysteresis and eddy current characteristics of a known sample) differences in the composition, hardness, temper and electrical conductivity of ferrous specimens more quickly than by chemical analysis or spectrography.

Cracks and seams in both ferrous and non-ferrous components are revealed by a radio-frequency detector [2] which can be adjusted by unskilled operators, so being suitable for rapid production-line testing. Passage of a faulty sample through the coil forming part of a tuned circuit alters the frequency, which actuates selective relays, causing a pilot lamp to glow while depth of fault is indicated on the dial.

There is a portable layer-thickness meter for gauging paint or electro-deposited or sprayed metal on sheet steel with the aid of an exploring "head" consisting of a miniature transformer furnished with a constant primary current so that the induced secondary voltage is a measure of the width of gap (thickness of paint) between the "head" and the surface it explores.

A mains operated metal-thickness meter for gauging cable sheaths, boiler shells, pipe-walls, etc., from one side only employs a valve-oscillated crystal which is held against the external surface to be measured. The resonant frequency of the latter damps crystal vibration, so changing the indications of the meter.

An instrument taking 50W from the mains finds pin holes in enamelled wire, down to very fine gauges, by passage through a mercury bath. Contact thus made through faulty enamel actuates a telephone-type counter; the length of wire tested is recorded at the same time.

A three-range vibration analyser uses microphone pickups and five-valve amplifier with an attenuator followed by a frequency limiting network passing output to three resistance-capacity coupled valve stages, thence through a bridge-connected metal rectifier to the indicating meter. The outfit can alternatively detect leaks in buried water pipes and noises in pipes and structural steel work, or be used (without pick-up) as a valve voltmeter, or sensitive indicator for AC bridge circuits.

A thermionic moisture meter, designed to measure the extremely high resistance of timber with the aid of a "prod" electrode, is also adaptable to paper, textiles, tobacco and the separation of wet from dry grain.

High-frequency Devices

The third group comprises thermionic instruments for radio testing and higher-frequency applications. The remarkably small "Miniscope"[3] oscillograph utilises a 1·5 in. diameter cathode-ray tube, its price being within the scope of most service engineers.

Several kinds of valve voltmeter are made[4], including a relatively cheap portable instrument with special features for colleges. A model, for dielectric and induction heating apparatus, has interchangeable "heads" for range changing up to 10,000V at up to 100 Mc/s; it is mains operated, consuming 10W. An electronic type depends upon the linear relationship in a cathode-ray tube between the (high) anode and (negative) grid voltages; the latter is varied until the beam is extinguished, when the meter indicates the anode value (RMS) directly up to

See *Electrical Review*, (1) November 10th, (2) July 28th, 1944, (3) January 11th, 1946, and (4) September 5th, 1941.

10,000V, peaks being independent of wave form.

The electronic frequency meter is more convenient than an audio or heterodyne type when the source being measured contains noise components, interference, or harmonics.

The fourth group of miscellaneous devices included an unusually precise photoelectric photometer and a photometric light meter operating on the telescopic principle for distant photographic and similar brightness measurements.

There was also a readily portable wire recorder of sound and speech; a precise slow-motion drive for instrument dials with friction epicyclic gearing enclosed in bakelite and many other products of the Salford works.

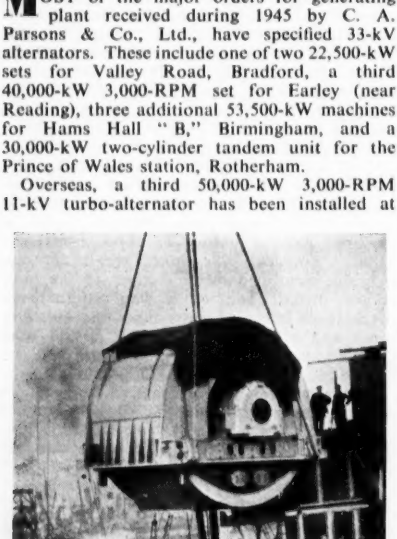
Manufacturers' Activities—I

Achievements During the Past Year

C. A. Parsons & Co., Ltd.

MOST of the major orders for generating plant received during 1945 by C. A. Parsons & Co., Ltd., have specified 33-kV alternators. These include one of two 22,500-kW sets for Valley Road, Bradford, a third 40,000-kW 3,000-RPM set for Earley (near Reading), three additional 53,500-kW machines for Hams Hall "B," Birmingham, and a 30,000-kW two-cylinder tandem unit for the Prince of Wales station, Rotherham.

Overseas, a third 50,000-kW 3,000-RPM 11-kV turbo-alternator has been installed at Bunnerong, Australia. Similar units, except that the alternators will be wound for 33 kV, are to be built for White Bay, New South Wales, and Cossipore, India. For Table Bay, South Africa, a further 3,000-RPM 40,000 33-kV set is under construction. A 30,000-kW 22-kV unit has been put into service at Newport "C," Victoria Electricity Commission, and a 12,500-kW set at Halifax, Nova Scotia. Smaller turbo-alternators for both home and abroad include a number of pass-out geared units.



Main propulsion motor of the *Beaverdell* being transferred from coaster to ship

Marine developments include an order for the propulsion machinery of a fourth liner, the construction of two other equipments and the completion of the installation for the *Beaverdell*. The main 9,000 SHP motor for this vessel, being 15 ft. 6 in. high, could not be transported from the Tyne to Greenock by either road or rail and was therefore sent by sea. The overall dimensions of the load when placed on the vehicle used for the short journey to Newcastle were 18 ft. 6 in. high by 19 ft. long by 16 ft. wide and the weight was 110 tons.

The turbines operate with steam conditions of 800 lb. per sq. in. and 850 deg. F., the steam being reheated to the initial temperature before entering the tandem low-pressure cylinder. Each alternator is connected through a hand-operated control cubicle to a double-unit motor which drives the single propelling screw. A Diesel-driven alternator, which can also be connected to either half of the motor for emergency use, supplies auxiliaries.

Notable work of the transformer department was the completion of a 20-MVA 33/66-kV ON/OFB unit for the Central Electricity Board with an on-load tap-changer of new design which permits inspection and maintenance of the diverter switches without opening the main tap-changer tank; the phases of these switches are in separate tanks. Another C.E.B. contract covered the manufacture of two 45,000-kVA 132/33-kV transformers, the design for the higher-voltage windings of which is based on impulse-voltage tests on full-scale windings at Parsons' own laboratory. Mining-type transformers of 300 and 400-kVA, of the limiting dimensions prescribed for 250 kVA, are being made with the five-limb type of three-phase core. Among the large number of distribution transformers in hand are a hundred of various sizes for France.

Indicator Lamps

A revised version of BS.1050 is now available, which specifies the dimension of visual indicator lamps for telephone switchboards and similar purposes; also the quality and arrangement of the filament, the material and sizes of connection plates and end-pieces as well as general requirements for individual types. The selection of lamps for test and conditions of test are also dealt with. Copies are obtainable for 2s. each from the British Standards Institution, 28, Victoria Street, London, S.W.1.

ELECTRICITY SUPPLY

New Birmingham Station. Fire at Salford.

Ashford.—SAFEGUARDING THE SUPPLY.—In a report to the January meeting of the Urban District Council the Electricity Committee stated that the construction of the bulk supply lines from the C.E.B. substation at Folkestone to Ashford was such that it was impossible to work on one circuit with the other circuit remaining alive. A scheme to safeguard the position would mean a very heavy capital expenditure. The Council decided to obtain a report on the position and on a safeguarding scheme.

DEVELOPMENTS IN PROSPECT.—The Electricity Committee proposes capital expenditure during the year 1946-47 amounting to over £40,000. Items included are: Supplies to Osborne Road permanent housing estate and temporary housing estates, £7,350; Willesborough substation and mains alterations, £3,700; mains extensions, £12,500; mains reinforcements, £10,000; services, £2,000; meters, cookers, etc., £3,500. The Electricity Commissioners have approved the borrowing of £5,491 for distribution extensions.

Barrow-in-Furness. — ARRANGEMENT WITH ULVERSTON.—The Electricity Committee has discussed the question of boundary supplies with the Ulverston U.D.C. and has come to an arrangement for the Next Ness area to be developed by the Ulverston authority, and the Newland, Netherhouses and Broughton Beck areas by Barrow.

Birkenhead.—SUPPLY TO TEMPORARY HOUSES. —The Electricity Committee is to lay mains at a cost of £1,400 to supply 122 temporary bungalows at Rock Ferry.

Birmingham.—NEW POWER STATION.—In September last the Electric Supply Committee received a direction from the Central Electricity Board to extend the Nechells (Princes) generating station. The Committee's recommendations on the subject, submitted to the City Council last week, provide for the construction of a new station near the old one. The Committee states that owing to outmoded design and layout the operating results at the present station, which was finally completed in 1928, fall far short of what can be expected with modern equipment. To install new plant in the existing building would cost annually £41,500 more than the annual cost of building a new station, while sacrificing an additional generating capacity of 106,500 kW.

The new station, when completed, will include four 50,000-kW turbo-alternators, three cooling towers 300 ft. high by 180 ft diameter and two 350-ft. chimneys, and the total cost, based on present prices, will be approximately £7,600,000, of this sum £4,460,000 is the estimated cost of works at present projected. The report adds that district heating could be provided equally satisfactorily from a generating plant separate from, but in the immediate vicinity of, the main station, and consequently the design and operation of the new generating station could proceed independently of any district heating project.

ELECTRIFICATION OF GASWORKS PLANT.—The Gas Committee, in a scheme for gasworks extensions, has approved an estimate of £16,600 for the electrification of boosters at Washwood Heath.

Bradford.—CONSUMERS' APPARATUS.—Application is being made by the Electricity Committee for sanction to borrow £30,000 for consumers' apparatus.

Brighouse.—NO SIMPLE HIRE.—A recommendation which was debated at the last meeting of the Town Council proposed the immediate reintroduction of facilities for the hire-purchase of gas and electrical appliances and the discontinuance of simple hire, except that apparatus at present hired out should continue on that basis, with an increase of 20 per cent. in the charges. After the Councillor L. Kaye had moved the reference back of the part relating to simple hire. Councillor F. L. Kilby, chairman of the Electricity Committee, said that the subject had been under discussion for some time and he thought it was the opinion of the majority of the Council that the system of simple hire should now be dropped as it was out of date. He regretted to say it was an acknowledged fact that people would not take care of appliances which did not belong to them. Hire-purchase instilled a feeling of ownership. The amendment was defeated by 15 votes to 13.

Burton-on-Trent.—SITE FOR POWER STATION.— In response to a request by the Central Electricity Board the Electricity Committee is to take steps to acquire the Drakelowe site for the erection of a new power station.

SUPPLY TO HOUSING ESTATE.—The Electricity Committee is to provide electricity to housing estates being developed by the Repton R.D.C. at a cost of £6,050.

Cardiff.—HIRE OF WATER HEATERS.—The Electricity Committee has fixed the charge for the simple hire of water heaters at 6s. per quarter.

Hastings.—DISTRIBUTION EXTENSIONS.—The Electricity Committee has arranged for the provision of an additional supply to Gypsum Mines, Ltd., at Mountfield at a cost of £25,375 for cables and switchgear. A supply is to be provided to Houghton Green and Star Lock at a cost of £3,265 and to a housing estate at Cadborough Road, Rye (£2,026).

Leeds.—STREET LIGHTING CHANGE.—After being for twenty-five years under the control of the Gas Committee, the administration of street lighting has been taken over by a new City Lighting Committee. At its first meeting the Committee recommended the appointment of a city lighting engineer who will be independent of both the electricity and gas undertakings.

Leicester.—NEW SUBSTATION.—The total cost of the building and equipment of the Devana substation, to be erected in Marina Road, is reported by the Electricity Committee to be £134,610, and the City Council is recommended to apply to the Electricity Commissioners for consent to the borrowing of this sum.

Lincoln.—COST OF POWER STATION EXTENSIONS.—Revised estimates for the extensions to the generating station at St. Swithin's, based on

present costs, amount to £1,448,516. Application is to be made to borrow this sum, less £500,000 for which loan sanction has already been issued.

Menai Bridge.—SALE OF UNDERTAKING DISCUSSED.—At a meeting of the Urban District Council reference was made to the suggested sale of the electricity undertaking. It was reported that the Bangor Electricity Committee had sent a letter to the Electricity Commissioners who had replied that it would not be advisable at the moment to negotiate in view of the prospects of nationalisation.

North Wales.—DEVELOPMENT AND NATIONALISATION.—At a meeting of the North Wales and South Cheshire Joint Electricity Authority at Llandudno last week, Mr. James Rankin, manager of the North Wales Power Company, said the £15,000,000 scheme for hydro-electric power development was in an advanced stage of preparation and the company felt the plans should go forward. It was, however, with other electrical undertakings, concerned about the question of compensation for capital expenditure on large projects incurred by private enterprise. This was a matter on which the Government was silent and it was highly dangerous for undertakings to embark upon any large capital expenditure at present. The Minister of Fuel and Power had warned against extravagant expenditure on schemes of interim development in anticipation of nationalisation. Alderman A. Hewitt, the chairman, said it was the Joint Authority's intention to develop electricity by water power and to generate sufficient supplies for the needs of North Wales and for export purposes. It would seem likely now that such a project would have to wait until nationalisation came. The Authority decided to represent to the Electricity Commissioners and the Ministry of Fuel and Power that schemes of rural electrification should be allowed to proceed as soon as possible.

Oxford.—DEVELOPMENT PLANS.—Included in the estimates of the Electricity Committee for 1946-47 are £30,000 for distribution, development and change of voltage, and £7,500 for the acquisition of domestic electrical apparatus for hire and hire-purchase.

Salford.—FIRE CAUSES BREAKDOWN.—Serious damage was caused by a fire which broke out at the 33-kV switchgear house at the Frederick Road distribution centre on Thursday last week. As a result of the fire supplies in most of Salford and Prestwick were cut off for just under two hours. The cause of the fire has not yet been ascertained, but it involved the ignition of a large quantity of switch oil.

Sheerness.—OVERHEAD LINE.—The Kent Rivers Catchment Board has agreed to a scheme of the Sheerness & District Electric Supply Co. for an overhead line from Key Street to Queenborough, including the laying of cables through the Swale walls.

South Shields.—STREET-LIGHTING CHANGEOVER.—The Corporation Electricity Committee's estimates include £27,200 for changing gas lighting in streets to electricity.

SUBSTATION ALTERATIONS.—The change-over from 5,500 to 11,000 V at Tyne Dock substation is to be completed this year.

RECTIFIERS AND BATTERIES.—The Cleansing Committee's estimates include £1,000 for replacing existing motor generators by rectifiers and £735 for the purchase of three electric vehicle batteries.

Southwark.—SUPPLY TO FACTORY.—The Electricity Committee is to provide a supply at a cost of £1,800 to A.J. Plunkett & Co., Ltd., at a new factory at Camberwell Road.

West Midlands.—COAL HANDLING PLANT.—The Joint Electricity Authority has placed a contract valued at £100,000 with Strachan & Henshaw, Ltd., for the complete coal-handling plant for the new power station at Ocker Hill, Tipton, Staffordshire. The new station is already partly constructed and is expected to be in operation by about the middle of the winter of 1946-47.

TRANSPORT

Cardiff.—TRAMWAY ABANDONMENT. — The Transport Committee is seeking sanction to borrow £287,500 for a scheme for the abandonment of tramways, replacement by trolley vehicles, and road works.

Manchester.—TROLLEY-BUSES.—The Transport Committee is to purchase thirteen trolley-buses at a cost of £52,960.

Newcastle - upon - Tyne.—TROLLEY-BUSES TO CROSS TYNE.—The Corporation proposes to exercise its powers to use trolley vehicles over the High Level and New Tyne bridges. The Transport and Electricity Committee recommends that notice be given to the Gateshead District Tramways Company of the intention to use the vehicles over both bridges and the carrying out of necessary works for operating the vehicles.

Sunderland.—MORE TRAMS.—The transport manager, Mr. C. A. Hopkins, is to report on the replacement of certain tram services by motor buses. A complete change-over from trams to buses may be carried out over a period of years, but in the meantime a further twelve trams are to be brought into use.

Proposed New Generating Stations

THE Central Electricity Board has received from the Electricity Commissioners a further alteration and extension scheme amending the existing electricity schemes for South-West England and South Wales by providing for four additional generating stations to be erected in the area as selected stations. There are at present seventeen selected stations in this area and the earlier schemes contained provisions for two others. As a result of a review of the prospective plant requirements of the area, the Board has come to the conclusion that it is necessary to take steps for the establishment of four more stations with first sections each with up to 130,000 kW of generating plant. One of the new stations will be required in time to meet the estimated demand arising in the South Wales district in 1949 and the others to meet the anticipated growth in the demand in the area in later years.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

W. B. Dick & Co. (Holdings), Ltd.—Referring at the annual meeting to the recent offer made to the ordinary shareholders by C. C. Wakefield & Co., Ltd., the chairman (Sir Herbert A. Walker) said that acceptances had been received in respect of 96 per cent. of the ordinary share capital. In the circumstances of these negotiations it had not been feasible to declare a further dividend on those shares to the interim of 4 per cent. paid in November, 1944, and now the offer provided that all future dividends would accrue to the purchasers. The acquisition of the ordinary shares would in no way alter the position of the preference shareholders. Regarding the future activity and policy of the operating company (W. B. Dick & Co., Ltd.), the intention was that its identity would be maintained and the staff of the company would not be affected by this transference of shares. The board considered that the combination of the company with C. C. Wakefield & Co. should prove beneficial to both concerns in view of the complementary nature of their business.

A statement reviewing the accounts showed that the profit for the year to December 31st, 1944, of the operating company was £112,420, against £125,566 for 1943. After making taxation provision there remained an income of £36,016 receivable by the parent company. Adding sundry other income less expenditure the net profit for the year was £35,865.

The Lancashire Electric Light & Power Co. proposes to create an additional 2,000,000 £1 shares, raising the capital to £6,471,415. It is intended to issue 1,000,000 of these as 3¼ per cent. cumulative preference shares ranking for repayment of capital equally with the existing 7 per cent. cumulative preference. After issue the shares will be converted into stock. A meeting to consider resolutions to effect this and alter the articles of association is to be held on January 29th.

The General Cable Manufacturing Co., Ltd., reports a net profit for the year ended September 30th last of £76,383 (against £79,199 in 1943-44). Taxation absorbs £50,421 (£58,400) and £9,000 (nil) is applied to deferred repairs; no transfer is made this year to reserve (against £5,000). After payment of the preference dividend and maintaining the ordinary dividend at 15 per cent. for the year, £4,132 (£2,920) is carried forward.

The Ship Carbon Co. of Great Britain, Ltd., reports a net profit for 1944-45 of £77,227, as compared with £105,081 for the preceding year. The ordinary dividend is maintained at 10 per cent.

Cape Electric Tramways, Ltd.—As shown in the preliminary statement (*Electrical Review*, December 7th, 1945) the net profit for the year to June 30th last was £55,209 (against £47,809), to which is added £61,769 (£63,433) brought in. The dividend is maintained at 6 per cent., £20,000 is allocated to replacements reserve and £67,505 is carried forward. It is stated that at the end of the year under review orders for additional vehicles, etc., to the value of £450,000 remained unexecuted, an increase of £100,000, but limited shipments might be expected in the early part of 1946. Abnormal conditions have continued in traffic and working costs. Gross receipts rose during the year from £1,232,535 to £1,326,109, and since June 30th both revenue and expenditure have remained at a high level.

New Companies

Sandelec, Ltd.—Private company. Registered January 3rd. Capital, £1,000. Objects: To carry on the business of manufacturers of, and dealers in, engineering products, electrical appliances, motors, batteries, wireless goods, etc. Directors: Kathleen Graham, 1, Sandy Lane, Hampton Wick; and S. Frais, 130, Bickenhall Mansions, Baker Street, W.1. Registered office: 46A, Finsbury Square, E.C.2.

Sleigh & Wood, Ltd.—Private company. Registered January 7th. Capital, £3,000. Objects: To carry on the business of manufacturers of, and dealers in, electrical plant, appliances and supplies, railway locomotives, and running stock, motor buses, cars, etc. Directors: L. Charlton and Mrs. H. C. Charlton, both of 7, Westacre Gardens, Newcastle-on-Tyne, 5. Registered office: 12, North Terrace, Newcastle-on-Tyne.

Lonsdale Electrical & Mechanical Products, Ltd.—Private company. Registered January 4th. Capital, £100. Objects: To carry on the business of wholesale and retail merchants, manufacturers, manufacturers of, and dealers in, electrical and mechanical goods and associated products, etc. Directors: J. Peace, Glenhaven, Gloucester Gate, N.W.1, and Mrs. D. W. Warburton, 117, Castlenau, Barnes, S.W.13. Registered office: 126, Great Church Lane, W.6.

Manor-Lectric, Ltd. — Private company. Registered January 3rd. Capital, £100. Objects: To carry on the business of electrical engineers and contractors, etc. Directors: C. H. Bedwell, 49, Manor Road, Barnet, Herts; and E. Morrison, "Temlett," Manor Road, Barnet. Registered office: 23/5, Wood Street, Barnet.

Electrohms (Installations), Ltd.—Private company. Registered January 5th. Capital, £100. Objects: To carry on the business of electrical contractors, electrical and mechanical engineers, etc. Subscribers: S. Goodston and Sadie Goodston, both of 1, Sillwood Place, Brighton. Registered office: 16, Irving Street, W.C.2.

Bedford Radio & Television, Ltd.—Private company. Registered December 19th. Capital, £500. Objects: To carry on the business of radio and television engineers, etc. Directors: H. T. Lee, 22, Clarendon Road, Bedford; and W. J. Moore, 44, Harpur Street, Bedford.

Star-Lite Manufacturing Co., Ltd.—Private company. Registered January 4th. Capital, £500. Objects: To carry on the business of manufacturers of, dealers in, and agents for, the

sale of lamp shades, lamp shade trimmings and frames, lamp standards, electrical and artificial lighting apparatus, etc. Directors: A. Sanders, Kingston Ridge Hotel, Kingston Ridge, near Lewes, and D. E. Moore, 11, Beauchamp Place, S.W.3. Registered office: 11, Beauchamp Place, S.W.3.

Thurlborn & Nicholls, Ltd.—Private company. Registered December 28th. Capital, £4,000. Objects : To carry on the business of buyers, sellers and repairers of, and wholesale and retail dealers in, wireless and television sets and component parts and accessories of all kinds, electric accumulators and batteries, electrical appliances. Directors: E. H. Thurlborn, Tea Villa, High Road, Gorefield, Cambs., and A. J. Nicholls, Church Road, Leverington, Wisbech. Registered office: "Tea Villa," High Road, Gorefield, Cambs.

Denco (Clacton), Ltd.—Private company. Registered December 29th. Capital, £10,000. Objects: To acquire the business of radio and electrical manufacturers carried on by D. W. Heightman, as "Denco," at 357, Old Road, Clacton-on-Sea. Subscribers: D. W. Heightman, 234, Burrs Road, Clacton, Essex, and G. Ranft, 59, Beresford Road, Cheam, Surrey. Registered office: 357, Old Road, Clacton-on-Sea.

Robert Morrell (London), Ltd.—Private company. Registered December 22nd. Capital, £1,000. Objects: To carry on the business of manufacturers, wholesalers and retailers of, agents for, and dealers in, and hirers out of, electrical fittings, appliances and apparatus, radio and television sets, gramophones, etc. Subscribers: J. M. Reeves and N. Field, both of 76, New Cavendish Street, W.1.

Banham & Co., Ltd.—Private company. Registered December 14th. Capital, £6,000. Objects: To carry on the business of manufacturers, importers and exporters of, and dealers in, electric irons, fires, stoves, cookers and household appliances, etc. Directors : F. W. Banham, 261, Crescent Drive, Petts Wood, Kent, and three others. Registered office : 30, Fleet St., E.C.4.

Electromech Appliance, Ltd.—Private company. Registered January 7th. Capital, £2,000. Objects: To carry on the business of manufacturers of, and dealers in, electrical, electronic, radio and mechanical devices, etc. Directors: H. Riant, 21, Winchester Road, Urmston, and Cyril H. Walker, 19, Winchester Road, Urmston. Registered office: Floures Works, Trafford Park Road, Manchester.

R.E.C. Electrical Engineering Co., Ltd.—Private company. Registered December 21st. Capital, £100. Objects: To carry on the business of manufacturers of, and dealers in, hirers, repairers, assemblers and constructors of electric, electronic, cinematograph, photographic and electro-medical apparatus and equipment, etc. Subscribers: S. Dalton, 52, Bull Lane, Liverpool, 2; and Nora E. Davies, 97A, Banks Road, West Kirby, Cheshire.

Harmsworth Products (Plastics), Ltd.—Private company. Registered January 2nd. Capital, £500. Objects: To carry on the business of manufacturers of, and dealers in, plastic substances and goods made therefrom, including electrical and wireless goods, domestic utensils, appliances and fittings, etc. Subscribers: H. B. Thomas, 40, Trinity Court, Grays Inn Road, W.C.1., and E. V. Cherubini, 1, Kingsbridge Road, Morden, Surrey. Registered office, 83, Dean Street, W.1.

Polin, Ltd.—Private company. Registered December 20th. Capital, £1,000. Objects: To carry on the business of electrical and mechanical engineers, radio dealers, etc. Subscribers: Phyllis I. Farley and M. Mackenzie, 10, Upper Park Road, Bromley, Kent. Registered office: 130, Regent's Park Road, N.3.

P.L.I., Ltd.—Private company. Registered November 23rd. Capital, £500. Objects: To carry on the business of electrical and general engineers, etc. First directors: F. C. Gardner, 58, Newbolt Avenue, Cheam, and three others. Registered office: 12, Broad Court, W.C.2.

Increases of Capital

Correx Communication Equipment, Ltd.—The nominal capital has been increased by the addition of £2,500 beyond the registered capital of £500. The additional capital is divided into 2,500 shares of £1 each, ranking *pari passu* with the existing shares.

Mortgages and Charges

Ward Electrical Engineering Co., Ltd.—Mortgage on debt of £295 4s. 4d., owing to the company from Geometric Tool & Gauge Co., Ltd. (in members' voluntary liquidation), dated December 5th, 1945, to secure £510 2s. 2d., and all further moneys due or to become due from the company to chargee (Falk, Stadelmann & Co., Ltd.).

Ranelagh Radio & Electrical Co., Ltd.—Particulars filed of debentures not exceeding £1,000, authorised December 12th, 1945, charged on the company's property, present and future, including uncalled capital, the amount of the present issue being £100.

S. E. Homes (Service), Ltd.—Charge on 67, York Road, Lambeth, S.E.1, dated December 13th, 1945, to secure £3,000. Holders: A. E. Le Maitre, 32, Huron Road, Balham, S.W.17, and another.

Corlett Electrical Engineering Co. (1933), Ltd.—Charge on 85, Wallgate, Wigan, dated November 30th, 1945, to secure all moneys due or to become due from the company to Barclays Bank, Ltd.

Bankruptcies

M. F. R. Plowman, electrical engineer, 67, Cambridge Street, Stafford.—First meeting January 22nd at Official Receiver's Office, 12, Lonsdale Street, Stoke-on-Trent. Public examination February 8th at the Shire Hall, Stafford.

J. F. Ludlow and **R. R. Ludlow,** trading in co-partnership as Ludlow Brothers at 196, Church Road, Redfield, Bristol, electrical contractors (separate application of R. R. Ludlow). —Order for discharge made December 14th, suspended for one week.

J. J. Symons (carrying on business as the Zodiac Peerless Electric Lamp Company), 25, Denmark Street, Charing Cross Road, London. —First and final dividend of 5s. 2½d. in the £ payable January 25th at Bankruptcy Buildings, Carey Street, London, W.C.2.

STOCKS AND SHARES

CONFLICTING influences are at work in the Stock Exchange markets as is, indeed, usual at this time of year. On the one hand, money is released which previously had been held back with a view to its making a good show in bank balances at the end of a year. On the other hand, the demands of the tax collector, and the normal increase in the volume of sales made to provide death duties, are an adverse factor. These various considerations cancel each other out, so to speak, at any rate to some extent, and there is a good deal of business doing in most of the Stock Exchange markets, that prices keep steady on the whole.

It is generally assumed that the reports and balance sheets in respect of the current year are likely to reflect difficulties encountered by reason of the change-over from war conditions to those of peace. In certain instances there will be little alteration. Some companies can bridge the hiatus with slight loss of trade and profit, but these are exceptional, and before the restoration of normal peace activity can be achieved, a temporary falling off of earnings is bound to occur. Prices of the ordinary shares in front rank undertakings are well maintained. So far as the electricity supply industry is concerned, the leading companies are too well entrenched financially for moderate declines in earnings to affect dividends.

Fluctuations in Prices

The first full week's Stock Exchange work in the New Year shows that changes, as compared with those of the end of last December, are mostly of little consequence. The ordinary shares of the Home electricity supply list are almost unchanged. West Devon at 25s. 6d. and West Gloucester at 26s., have each gained 6d. Tokyo Electric sixes are 2½ up, at 50. A fall in Calcutta Trams to 71s. 6d. is an unfavourable feature in the transport group. Of the equipment and manufacturing shares, British Insulated Callenders are prominent with a rise of 2s. 6d. to 47s., and Johnson & Phillips at 81s. 3d. have fully regained the recent fall. Falk Stadelmann at 42s. 6d. have risen ½, Vactric, 2s. to 23s. 9d. Improvements also occurred in Associated Electrical, 56s. 6d., Automatic Telephone, 70s., Crompton Parkinson, 31s. 6d., Murex 92s. 6d., and a few others.

E.P.T. Considerations

While speculation becomes increasingly interested in the chances of a further reduction of E.P.T. in the next Budget, the results of the heavy wartime payments already made under that heading have a bearing on the present outlook for many industrial shares. One result will, of course, be the eventual refunding of 20 per cent. of the amounts paid since the rate of the tax was raised to 100 per cent. This refund, the Chancellor has made it plain, must be used for such purposes as re-equipment and reconversion; it may not be distributed as dividend or bonus to shareholders.

A second consideration in connection with payments already made is referred to frequently as the "E.P.T. cushion." It is argued that a company which has been paying away in taxes the greater part of any earnings in excess of those of the pre-war standard years, can afford to see a substantial drop in its gross earnings before the amount actually available for dividend distributions becomes seriously threatened.

Telegraphs and Telephones

Instead of transatlantic stocks and shares being flat on the news of the serious labour troubles in the States, the reverse has happened. Brazilian Tractions rose 2½, to 32½, above their New Year's Eve price. International "Tel. & Tel." moved contrary to the general trend, the price going back ½ to 37. Amongst the sterling shares, Marconi Marines at 33s. 3d., are up 1s. Anglo-American Telegraph deferred went back a point to 31½ upon the curtailment of the transatlantic traffic. Cable & Wireless stocks were not greatly affected. The ordinary at 101½ is but 10s. down since a fortnight ago. Great Northern Telegraphs recovered 10s. of their 4½ points fall at the end of last year.

Lancashire Electric Capital

Shareholders of Lancashire Electric Light & Power will be asked at a meeting at the end of this month to agree to the creation of a further two million £1 shares. The intention is to issue a million of them (to be converted later into stock) in the shape of 3¾ per cent. preference capital. For the purposes of capital repayment they are to rank equally with the existing 7 per cent. participating preference stock, which has priority for capital but no further participation rights except for dividend. In that respect, they share surplus earnings with the ordinary after the latter have received 7 per cent. The maximum participation in this way is 3 per cent., and the present addition is ½ per cent. Taking this into account, the yield on the shares, at 32s. is £4 13s. 9d. per cent., or about 3s. per cent. more than the return on the ordinary shares at 33s. 3d.

Edmundsons Preference

Although anxiety about the high-priced preference shares of companies on the nationalisation programme have been allayed by the terms of the Coal Bill, special interest is attached nevertheless to Edmundsons Electricity Corporation 7 per cent. preference because of their participation rights in winding up. In that event, the 7 per cent. preference stock is entitled to priority for capital, and, after all the rest of the capital has been repaid, to equal participation pro rata with the ordinary in any surplus. The value of these rights cannot be precisely estimated, but on any reasonable assumption they should be worth having.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1*s. each*) *may be obtained from the Patent Office*, 25, *Southampton Buildings, London, W.C.*2.

ALLMANNA Svenska Elektriska Aktiebolaget.—" Ship propeller driving arrangements having electrodynamic slip couplings." 171/44. December 30th, 1942. (574233.) " Cable ways." 15610/44. August 16th, 1943. (574315.)

Automatic Telephone & Electric Co., Ltd., R. Taylor and G. T. Baker."—" Automatic switches for use in telephone or like systems." 1825. February 1st, 1944. (574312.)

Blackburn Aircraft, Ltd., and E. V. Hall.—" Spring clip for securing conduits, wiring and the like to structural parts." 1380. January 25th, 1944. (574263.)

British Insulated Cables, Ltd., and H. S. Northway.—" Lacquers." 1234. January 22nd, 1944. (574252.)

British Thomson-Houston Co., Ltd.—" Electric discharge lamp systems." 1609/44. February 2nd, 1943. (574300.)

British Thomson-Houston Co., Ltd. (General Electric Co.).—" X-ray apparatus." 18183. November 3rd, 1943. (574227.)

Bruno Patents, Inc.—" Connecting means for conductors of co-axial electrical transmission lines." 19028/43. November 14th, 1942. (574230.)

Carr Fastener Co., Ltd., and G. Wagstaff.—" Holders for thermionic valves and the like and means for securing them to apertured supports." 3365. February 23rd, 1944. (574214.)

Cinema Television, Ltd., and A. Sommer.—" Electron multipliers and methods of manufacturing such multipliers." 1058. January 19th, 1944. (574237.)

E. K. Cole, Ltd., and M. Freund.—" Electric lighting fittings." 1094. January 20th, 1944. (574240.)

Cooke & Ferguson, Ltd., and R. Drucker.—" Electric cord grip." 1302. January 24th, 1944. (574259.)

L. E. Denton.—" Electric clocks." 17196. October 19th, 1943. (574169.)

Dorman & Smith, Ltd., and T. Atherton.—" Sparking plugs for internal-combustion engines." 651. January 12th, 1944. (574190.)

Dunlop Rubber Co., Ltd., and H. W. Trevaskis.—" Electrical switch apparatus for operating devices on aircraft, and other purposes." 12202. August 29th, 1942. (574269.)

T. R. Evans.—" Method and means of assembling and supporting an irrigation system in cooling towers and tower-like structures." 1445. January 26th, 1944. (574287.)

General Electric Co., Ltd., and H. G. Jenkins.—" Indicators comprising luminescent material adapted to be excited by black lamps." 7968. June 10th, 1942. (574218.)

General Electric Co., Ltd., and J. H. Partridge.—" Glasses containing lead." 15616. November 5th, 1942. (574275.)

J. D. Griffin.—" Electrically heated salt bath furnaces." 3442/43. November 21st, 1942. (574167.)

Hoffmann Manufacturing Co., Ltd., and C. H. Smith.—" Axle bearings for electrically driven rail vehicles." 1558. January 27th, 1944. (574297.)

A. R. H. Jones.—" Electrically heated hot water bottles." 680. January 13th, 1944. (574194.)

H. G. McClean and Crompton Parkinson, Ltd.—" Diesel-electric locomotives." 862. January 17th, 1944. (574208.)

C. W. Marriott.—" Electric hot plate for cooking ranges and other heating appliances." 19542. November 23rd, 1943. (574231.)

R. Saxon.—" Gas turbines and like prime movers." 1354. January 25th, 1944. (574260.)

E. C. R. Spooner and Magnesium Metal Corporation, Ltd. (Permanente Metals Corporation in part).—" Chilling nozzles for electric furnaces in connection with the carbothermic reduction of magnesium oxide." 1556. January 27th, 1944. (574296.)

Standard Telephones & Cables, Ltd., and H. Birkby.—" Joints for co-axial conductor electric cables." 802. January 15th, 1944. (574204.)

Standard Telephones & Cables, Ltd., and S. J. Powers.—" Sealing electric conductors through a glass envelope and to electric conductors for such purpose." 1203. January 21st, 1944. (574248.)

A. V. Summers.—" Electrical connections and methods of making the same." 886. January 17th, 1944. (574283.)

Telegraph Construction & Maintenance Co., Ltd., J. N. Dean, E. W. Smith and F. Mattingley.—" Electric cables." 706. January 13th, 1944. (574197.)

A. Tustin and Metropolitan-Vickers Electrical Co., Ltd.—" Electromagnetic devices." 7781. May 15th, 1943. (574276.)

A. R. Wejnarth.—" Process of manufacturing electric resistance elements durable at high temperature and proof against chemical action." 17740. October 27th, 1943. (Convention date not granted.) (574170.)

Electrical Temperature Measurement

THE electrical measurement of temperature is dealt with in the paper presented by MR. R. J. REDDING this month to the London Students' Section of the I.E.E.

It is pointed out that electrical methods are used for work needing the greatest accuracy; but the paper attempts to outline industrial practice only, which seldom utilises the resistance or " distance " thermometer above 400 deg. C. because of the advantages offered by so-called thermo-electric pyrometers, which are used in various forms up to 2,000 deg. C. Both kinds are dealt with by the author as well as radiation thermometers; he then considers associated indicating equipment, recorders, regulators and electric thermostats. His conclusions are that the measurement of temperature is a very wide subject, well developed and highly specialised.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Dorchester.—January 21st. Electricity Department. Supply and laying of h.v. and l.v. mains. (January 4th.)

Dumfries.—February 10th. Electricity Department. One 300-kVA and two 500-kVA transformers. (See this issue.)

Great Yarmouth.—February 1st. Electricity Department. Supply and delivery of domestic appliances and installation materials. (See this issue.)

Kensington.—February 12th. Borough Council. Electrical goods (cables, flexibles, tapes, conduits, fittings and accessories), for twelve months. Particulars from the town clerk, Town Hall, W.8.

Leeds.—February 8th. Transport Committee. Supply and erection of 3,000-kW automatic mercury arc rectifier equipment, complete with switchgear. (January 11th.)

Southend-on-Sea.—February 7th. Electricity Department. House service meters. (See this issue.)

Stoke-on-Trent.—January 29th. North-West Midlands J.E.A. Mains and cables and overhead lines and services. (January 11th.)

Orders Placed

Bury.—Electricity Committee. Accepted. Two 750-kVA transformers.—Ferranti.

Carlisle.—Housing Committee. Accepted. Electrical installations at demonstration houses at Croft House estate.—David Thomson & Sons.

Chesterfield.—Electricity Committee. Accepted. Cables—Aberdare Cables (£21,724) and Enfield Cables (£1,610). 150-kVA and 250-kVA transformers (£211 and £279 each respectively)—Ferranti. H.V. switchgear: Extension to existing boards at Sheffield Road substation (£198); Blacksmith's Yard substation (£865); Cutthorpe extension (£1,102); and Littlemoor and Mansfield Road extension (£6,942.)—Ferguson, Pailin.

Eccles.—Electricity Committee. Accepted. Switchboard (£751) and 500-kVA transformer (£451)—Metropolitan-Vickers.

Glasgow.—Corporation Health Committee. Accepted. Electric roasting ovens (£313) and four electric toasters (£203).—Carron Company.

Municipal Transport Committee. Accepted. Welding sets.—Murex.

Corporation Electricity Committee. Accepted. 440-V switchboard for Dalmarnock Sewage Works (£806).—M. & C. Switchgear, Ltd.

Hastings.—Electricity Committee. Recommended. Transformers for twelve months.—Bryce.

Manchester.—Electricity Committee. Accepted. Fluorescent lighting units, Stuart Street generating station.—Underwood (Electric).

Housing Committee. Accepted. Electrical installations at 34 houses on the Parkwood estate.—H. C. Taylor & Co.

Newcastle - under - Lyme. — Electricity Committee. Accepted. Overhead lines for supply to works at Apedale (£1,150).—British Insulated Callender's Cables.

Oldham.—Electricity Committee. Accepted. Substation switchgear.—Ferguson, Pailin. Cables.—Lancashire Cables and Scottish Cables.

Warrington.—Works Committee. Accepted. Traction batteries (£242).—Chloride Electrical Storage Co.

West Hartlepool.—Corporation. Accepted. Transformer.—Yorkshire Electric Transformer Co.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Abergavenny.—Houses (30), for R.D.C.; J. M. Jones, architect, St. Mary's Chambers.

Abingdon.—Permanent houses (100), Northcourt Road site; F. Russell Cox, architect, Blanket Hall, Witney, Oxon.

Banstead.—Houses (53), Horsecroft Meadow, for U.D.C.; W. Kenyon, architect, 15, Adeline Place, Bedford Square, W.C.1.

Barmouth.—Permanent houses (26), Recreation Ground site; surveyor, U.D.C. Offices.

Birkenhead.—Houses (492), Mount estate; borough engineer.

Bootle.—Hostel (£3,000); Y.M.C.A.

Bradford.—Flats (20), Eccleshill estate; city architect.

Burnley.—Houses (236), Woodbine estate; W. Eaves & Co., builders, Blackpool.

Caistor.—Houses (44), for R.D.C.; Sheppard, Lockton & Saunders, architects, 24, Castle Gate, Newark-on-Trent.

Cardiff.—Houses (840), various estates (£952,000); and hotel, etc., Airport (£20,000); city engineer.

Two blocks of flats, Blackstone Street; Hayes & Griffiths.

Charlton Kings.—Houses (56), Ewens Farm estate, for U.D.C.; Rainger & Rogers, architects, 29, Rodney Road, Cheltenham.

Chester.—Houses (£27,950), Christleton, for R.D.C.; Holland & Hannen & Cubitts, Ltd., builders, London, S.W.1.

Chesterfield.—Extensions, Penmore Hospital (£12,000); borough engineer.

Darlington.—Developments, Darlington Forge (£250,000); English Steel Corporation.

Doncaster.—Houses (150); F. Haslam, Ltd., builders, Hall Cross.

Dorchester.—Houses (22), Ackerman Road (£25,457) Ricardo, Ltd.

Eccles.—Works additions, Monton Road; H. S. Mitchell & Co., Ltd.

Eston (Grangetown-on-Tees).—Houses (34); surveyor, U.D.C. Offices.

Finchale (Co. Durham).—Extensions to Finchale Disabled Soldiers' Hospital; Thompson & Son, Church Chare, Chester-le-Street, Co. Durham.

Gateshead.—Flats (54); borough engineer.

Glasgow.—Factory extensions, Alexandra Parade; Imperial Tobacco Co., Ltd.

Permanent houses (760) and block of flats; city architect.

Hastings.—Alterations, Hollington Park school; K. F. Wray, architect.

Industrial premises, The Ridge; W. V. Braybon.

Hebburn-on-Tyne.—Office block, for Pyrotenax, Ltd.; Cackett, Burns Dick & McKellar, architects, 21, Ellison Place, Newcastle-on-Tyne.

Hemel Hempstead.—Extensions, Cattsdells Home (£2,141); E. J. Waterhouse & Son, Chipperfield.

Hetton.—Houses (178), Peat Carr estate and Low Moorsley, for U.D.C.; Fennell & Co., architects, Bridge End Chambers, Chester-le-Street.

Heywood.—Houses (24), Gooden Farm estate; E. F. Davis, Ltd., builders, Bank Street, Farnworth.

Inverness.—Houses (500); clerk, County Council.

Lanchester (Co. Durham).—Factory; A. J. Siris Products, Ltd.

Lincoln.—Houses (268), Boultham Moor estate; city engineer, Corporation Offices, Silver Street.

Littlehampton.—Sewage works (£100,000); J. D. & D. M. Watson, consulting engineers.

Lymm.—Houses (32), Orchard Avenue, for U.D.C.; T. Ashcroft, clerk.

Manchester.—Two schools, Wythenshawe; city architect.

Merthyr Tydfil.—Houses (54), Quakers Yard (£64,582); G. A. Brown (Builders), Ltd., Ebbw Vale, Mon.

Merton and Morden.—Houses (35), in three groups; U.D.C. surveyor, Morden Hall, London, S.W.19.

Middlesbrough.—Houses (43), Maldon Road; J. Gilmore, builder, West Lane, Linthorpe.

Additions, Constantine Technical College (£7,500); education architect, Woodlands Road.

Morley.—Houses (52), including electrical work (£57,686); Morley and District Building Trades Association, 52, Albion Street, Morley, near Leeds.

Newcastle-on-Tyne.—Houses (200), on the Blakelaw and Longbenton estates, for City Council; William Leech, builder, 2, Clayton Street.

Oldham.—Houses (40), Strinesdale and Stoneleigh sites (£45,150); W. Eaves & Co., Ltd., Vicarage Lane, Marton, Blackpool.

Oswestry.—Houses (100), Shrewsbury Road estate; borough surveyor, Guildhall.

Preston.—Permanent houses (688), Ribbleton Hall estate; borough engineer, Municipal Buildings.

Rye.—Houses (84), Cadborough Road; borough engineer.

Southport.—Police quarters, Tulketh Street (£14,000); borough engineer.

South Shields.—Branch clinics (£70,000), additions to maternity home (£25,000); and shopping centre, including 14 houses, at Horsley Hill (£30,000); borough engineer.

Factory, for Lambs Products, Ltd.; J. H. Morton & Son, architects, Martins Bank Chambers, Fowler Street.

Extensions to Harton Dye Works; T. A. Page, Son & Hill, King Street.

Stockport.—Block of 16 flats, Didsbury Road (£20,000); Jonathan Partington, Ltd., builders, Middleton Junction.

Sunderland.—Factory for Leylands Motors, Ltd.; W. & T. R. Milburn, 57, Fawcett Street.

Rebuilding a factory for Hartley, Wood, Ltd.; Jos. Huntley & Son, Marion Street.

Swansea.—Crematorium (£27,276); borough engineer.

Works additions, Siloh Road, Landore; Millbrook Engineering Co., Ltd.

Tynemouth.—Factory, West Chirton, for Dukes and Marcus of Kendal; North-Eastern Trading Estates, Ltd., Gateshead.

Walsall.—Houses, Coalpool estate (£79,247); Towers Wilson & Co. (26); J. & F. Wootton, Ltd. (23); and Deacon & Boardman, Ltd. (24).

Wallsend.—Houses (100); borough engineer.

Factory; Storey Sons & Parker, estate agents, High Place, Newcastle-on-Tyne.

Warrington.—Sewerage (£337,436); borough engineer.

West Hartlepool.—Houses (92), Seaton Lane estate; C. M. Yuill, Ltd., builders, Villiers Street.

Works additions; George Clark & Co. (West Hartlepool), Ltd.

West Lothian.—Houses (360), Stoneyburn, with electric lighting installations (£5,000); county architect, County Chambers, Linlithgow.

Whitley Bay.—Houses (50); U.D.C. surveyor.

Houses, Seatonville estate; A. Lisle & Sons, builders, Promontory Terrace.

Export Inquiries

WE have received the undermentioned inquiries from firms and individuals overseas who wish to secure agencies for British electrical equipment and appliances or to import them into their territories. We shall be glad to pass on to them replies received from readers which should be addressed to the Editors, quoting the number given in parentheses. We cannot vouch for the standing of inquirers and manufacturers replying to them will no doubt require the usual references:—

Greece.—London export merchants require large quantities of surface switches, plugs and sockets, adaptors and lampholders, a list of which they have sent us. (X.141.)

Sweden.—Importers require 640 oscillating table fans and ceiling fans. Copies of specifications, etc., available at this office. (X.142.)

Turkey.—Istanbul agent asks for supplies of cables and wires, telephone apparatus, lamps, motors, etc. (X.143.)